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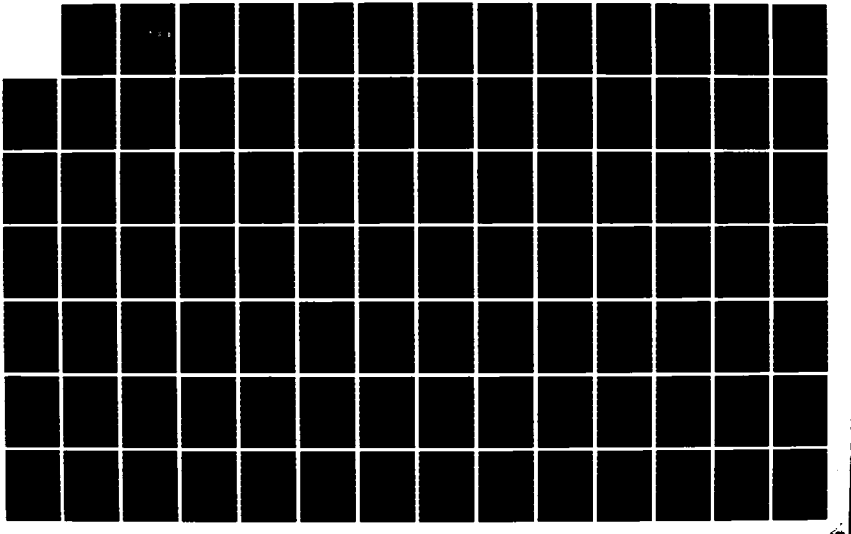

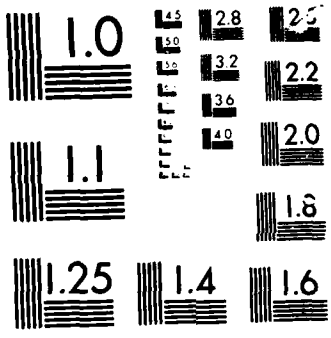
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NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

A SIMULATION MODEL OF ISSUE PROCESSING AT NAVAL SUPPLY DEPOT YOKOSUKA, JAPAN

by

Michael S. Clift

MAR 1986

Thesis Advisor: F. M. Perry

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A Simulation Model of Issue Processing at Naval Supply Depot Yokosuka, Japan

by

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Submitted in partial fulfillment of the requirements for the degree of

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ABSTRACT

A computer simulation program has been written in IBM's GPSS V to model the issue processing functions of U.S. Naval Supply Depot Yokosuka, Japan. The results of simulation experiments that may be conducted with the model can be used by analysts in the Planning Division of the Naval Supply Depot to predict actual Depot performance under conditions of surge demand.

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I. INTRODUCTION

A. THE PROBLEM

The U.S. Naval Supply Depot Yokosuka, Japan (NSD Yokosuka), is tasked with providing logistics support to U.S. Navy fleet units and shore activities in the Japan and Northern Pacific operating areas. As the major U.S. Navy logistics installation in Japan, NSD Yokosuka is the primary source of logistics support for all Navy and Marine Corps shore activities based in Japan. Fleet units supported by NSD Yokosuka include eleven homeported ships as well as deployed ships of the Seventh Fleet. Although NSD Yokosuka's major function is material support, it also provides essential supply services. The Freight Terminal Division is responsible for transshipment to the requisitioner of issue priority group one material received from stateside Naval Supply Centers and Defense Logistics Agency (DLA) activities. The Depot also manages a variety of other support services including contracting, data processing, accounting, disbursing and personal property shipment.

In addition to its basic fleet support role, NSD Yokosuka is tasked with tri-service support responsibilities for fuel and subsistence. NSD Yokosuka is the DLA Designated Specialized Support Point for provisions in Japan, providing subsistence support to all fleet units, DoD commissaries and troops in the Japan operating area. As the DLA agent for fuel, NSD Yokosuka operates the largest fuel complex in the Pacific. The Fuel Department provides bulk petroleum products to all military activities in the Western Pacific and maintains Prepositioned War Reserve Stock (PWRS) inventory levels to meet the anticipated combined requirements of the services in that area.

NSD Yokosuka is strategically positioned to support contingency operations in the Far East. Any conflict in the Northern Pacific, Korea, or other Southeast Asian country requiring extensive deployment of ships, aircraft and troops will result in a surge of activity for NSD Yokosuka. If the conflict is not short-term in duration, the increased operating tempo could be expected to result in new manpower requirements, multi-shift operation of the NSD and its detachments, possible expansion of physical storage facilities and the acquisition of additional material handling equipment. NSD Yokosuka's ability to respond to a surge in demand for logistics support brought about by a period of increased tension or open conflict is a critical issue to planning military operations in the Far Eastern theater. The NSD's effectiveness in this type of scenario hinges on its ability to escalate operations in a short time frame. Counter to the rapid response required of NSD Yokosuka in a contingency situation is the relative difficulty of mobilizing the necessary manpower and other resources on short notice. Planning specific requirements in advance and identifying sources to fill those needs is essential to maintaining supply readiness at NSD Yokosuka.

Predicting future resource requirements of the Depot is a primary function of the Planning and Comptroller Department, more specifically, the Planning Division. In any operating environment, NSD Yokosuka seeks to minimize the processing time associated with issuing material to customers while maximizing the availability of other support services required. To this end, the Planning Division projects the volume of demand that the Depot will be expected to support in various operational scenarios, i.e., positioning of an additional carrier battle group or a build-up in troop levels. Divisional requirements in support of those levels of operation are estimated. The

consolidated requirements of the Depot are quantified and plans outlining the allocation of resources among divisions are formulated.

B. THESIS OBJECTIVE

The objective of this thesis is to provide a predictive and quantitative tool to support the contingency planning efforts of (NSD) Yokosuka. A computer program modeling the issue processing functions of the Depot will be constructed. The program will be written in IBM's General Purpose Simulation System V (GPSS V). The completed program may be used to conduct experiments simulating Depot performance under conditions of surge demand. The information gathered in a controlled series of experiments with the model can be used to help formulate operating policy and resource distribution plans to cope with contingency situations.

C. SCOPE

The scope of the model will be limited to those functions of NSD Yokosuka in direct support of issue processing operations, from requisition receipt to the point of availability of the issue for shipment to the requisitioner (or the point of actual delivery to the requisitioner in the case of bearer walkthroughs, quick picks and issues delivered to Naval Base Yokosuka activities by NSD tractor trains). A detailed list of the actual processes to be simulated is provided in Chapter IV. Other Depot operations have been excluded for the following reasons:

1. The complexity of a model can be expected to increase as the scope of the system to be simulated is expanded. Limiting the scope of the system to mainstream issue processing functions will provide important information to analysts while keeping model modification and experimentation within the capability of personnel without extensive simulation experience.

2. The scope of the system to be simulated is also limited by the capabilities of the software and hardware on which it is implemented. The memory requirements of a program written to simulate all major functions of the Depot would exceed the maximum amount of memory addressable by GPSS V.

3. Model design and validation imposes substantial data collection responsibilities on the NSD Planning Division. Depot personnel resources were taxed to meet the data requirements imposed during development of the model of issue processing functions.

4. Some functions of the Depot are sufficiently complex to form the basis of major simulation projects by themselves. Inventory Control Department, Data Processing Service Center (DPSC) and Freight Terminal Division operations are all candidates for separate simulation projects.

5. Not all systems can be simulated with discrete simulation methods. The Fuel Department manages several processes that are best modeled by continuous simulation methods.

D. LIMITATIONS

1. Data Collection

Construction and validation of the model was hampered by difficulties experienced by the author during data collection. Due to the physical separation of NSD Yokosuka from the Naval Postgraduate School, the data collection effort was managed by the NSD Planning Division. Personnel from cognizant divisions of the Depot were tasked with collecting the data from retained records or by observation of the physical processes. The time-intensive nature of random sampling slowed the process of data collection. This was aggravated by competing operational requirements in the Inventory Control and Material Departments. At the time of this writing, the collection of service time samples for the Packing Section and half of the material storage areas remained incomplete.

2. Microcomputer Simulation

The initial objective of this thesis was to model NSD issue processing operations on a microcomputer. Efforts in that direction were blocked by the memory requirements of

the program. The technical details of this limitation are discussed briefly in Chapter II of the thesis.

E. ORGANIZATION OF THESIS

The balance of this thesis is devoted to the examination of simulation as a logistics planning tool and to the development and validation of a program to be used for simulation experimentation. In Chapter II, the suitability of simulation and other operations research disciplines to supporting logistics planning efforts is reviewed. A description of issue processing at NSD Yokosuka, the system to be modeled, forms the basis of Chapter III. Chapter IV utilizes GPSS block diagrams to explain the simulation program structure. Program verification and a discussion of program validation are presented in Chapter V. Guidance in experimentation techniques and a discussion of simulation experiments conducted by the author are included in Chapter VI. Recommendations and conclusions in Chapter VII will address further simulation experimentation and the observed benefits of simulation in supporting logistics planners.

II. MODELING TECHNIQUES

A. OPERATION RESEARCH

NSD Yokosuka's ability to provide the level of logistics support required by DoD activities in the Japan operating area is a product of the combined efforts of several work-centers. The DPSC Department and the Customer Services, Requirements, Storage, Labor and Equipment and Freight Terminal Divisions all perform tasks integral to the processing of requisitions received by NSD Yokosuka. Because a decision made in one division may affect the operations of another, the performance of individual divisions must be evaluated in terms of their contribution to overall Depot performance. This interaction between functional areas must be taken into account by the Planning Division during the formulation of operating strategies for surge demand environments. Operations research techniques incorporate the systems approach and can serve as an important logistics planning tool.

Operations research is a collection of mathematical tools that may be applied to solve practical decision problems within a system [Ref. 1]. The aim of operations research analysis is to evaluate the probable consequences of decision choices. These choices are typically concerned with the allocation of scarce resources within the system. Most methods of operations research use models to study the actual system [Ref. 2: p. 4]. Models represent objects of interest within the system as entities, the characteristics of entities as attributes and the interactions causing change within the system as activities. Models are employed when experimentation with the actual system is not a practical approach to analyzing operations. Accordingly, formulation of a model is a suitable method of predicting the

performance of a supply depot under conditions of surge demand.

Specialized operations research techniques have evolved to handle certain well-defined classes of systems problems. Network analysis may be used to solve transportation problems. Inventory algorithms are used to make inventory control decisions. These techniques are well suited to narrowly-defined problems and are regularly employed by the military to solve logistics problems. The study of broader, less well-defined systems require more generalized mathematical techniques.

Mathematical analysis is applied to systems management problems by representing attributes of the system as variables and activities as mathematical functions that interrelate the variables [Ref. 3: pp. 8-9]. Mathematical analysis is a sophisticated operations research technique that can be used only by analysts with extensive backgrounds in mathematics. It is not always possible to formulate a complete mathematical model of a complex system. The combined effects of uncertainty, dynamic interaction between decisions, interdependency among variables and the representation of processes over long time horizons are difficult to represent mathematically and may require alternative methods of research [Ref. 4: p. 142]. Stock point analysis problems fall into this category. The stochastic nature of requisition arrival and processing times, overlap between the operations of separate divisions within a supply depot, the relationship of requisition priority and type to the processing procedures followed and the need to observe operations over extended periods of time all support the use of computer simulation as a research tool.

B. SIMULATION

Simulation is the process of designing a model that duplicates the dynamic behavior of the essential

characteristics of a system for the purpose of studying that system [Ref. 5]. It is a popular technique among operations research practitioners. In a survey by Weston [Ref. 6] of 1000 U. S. firms, it was the most frequently employed quantitative tool. Simulation is also used extensively by the military to evaluate weapons and logistics systems. Because the structure of a simulation model bears a close relation to the logical structure of the real system, model development is simplified. Schmidt [Ref. 7] notes that the level of mathematical sophistication required to develop a simulation model of a complex system is generally less extensive than that required to develop a mathematical model, underscoring simulation's relative ease of use. It is this simplicity that makes simulation intuitively popular to analysts.

Simulation is a versatile operations research technique. It may be used as a descriptive tool (to describe a current system) or as a predictive tool (to explore a hypothetical system or design improvements to a current system). Simulation is also flexible with respect to changes in the actual system. Variables can be modified before a simulation is run, or dynamically, to align the model with real system conditions.

There are drawbacks to the use of simulation. Simulation does not optimize in the sense that calculus-based analytical methods do [Ref. 3: p. 38]. Optimal solutions may be obtained only through repetition of simulation experiments. Simulation models produce less precise results than does mathematical analysis [Ref. 2: p. 13]. Due to the probabilistic nature of simulation, the results of simulation experiments repeated in succession can be expected to vary and the sensitivity of a simulation model to changes in the value of input variables is not subject to exact measurement. Simulation models experience the same problems as

models employed in other techniques of operations research. They may appear to accurately reflect the real system, when in fact, they do not. Simulation models, as all others, will yield incorrect results if they are not validated carefully.

There are two major types of simulation, continuous and discrete [Ref. 4: p. 143]. Continuous simulation is concerned with systems that change continuously with respect to time and with measurements that are not restricted to integers. Refinery operations and rocket trajectories are examples of systems that are studied by the use of continuous simulation. In discrete simulation, the simulated time advances in a stepwise discrete fashion. A discrete simulation is time-oriented if the simulation clock is updated at regular time intervals. If the clock is updated by the scheduled occurrence of events, the simulation is termed event-oriented. Discrete event simulation lends itself especially well to the modeling of queuing systems and, therefore, is generally applicable to modeling the performance of service organizations that can be represented as a collection of service facilities and queues [Ref. 8].

Discrete event simulation is frequently used to model military supply depot operations. The use of discrete event simulation as a forecasting tool offers several advantages to logistics planners. Queue statistics gathered during the simulation pinpoint processing bottlenecks that may be expected to occur. Server utilization statistics collected for each functional area may be used to support resource allocation decisions. System throughput data can be quantified by measuring the processing time for the different classes of requisitions passing through the system. In addition, the model may be easily modified to reflect increasing levels of demand, changes in net effectiveness or the addition of personnel.

C. SIMULATION LANGUAGES

Discrete event simulation programs may be written in a general purpose programming language like FORTRAN or PASCAL, or in a special purpose simulation language. As computer simulation evolved as an operations research technique in the late 1950s, all simulations were written in general purpose or specific-machine languages. As researchers began to recognize the fact that many situations being simulated were composed of functionally similar processes, the need to develop special purpose languages in which single operators would perform common functions became apparent. Emshoff and Sisson [Ref. 9: p. 116] enumerated the functions common to all simulations that distinguish simulation languages from general purpose programming languages:

1. create random numbers
2. create random variates
3. advance time, either by one unit or to the next event
4. record data for output
5. perform statistical analyses on recorded data
6. arrange outputs in specified formats
7. detect and report logical inconsistencies and other error conditions

Kiviat [Ref. 10] cited programming convenience and concept articulation as the two major advantages of using a simulation language as opposed to a general purpose language.

Concept articulation refers to the ability of simulation languages to communicate the structure of a system being modeled through the use of a descriptive vocabulary. This is especially important to analysts in the model development phase. It also improves communication in that simulations are more easily explained to management and other non-programming oriented users.

The programming convenience of simulation languages is evidenced by the reduction in both program length and

development effort required. Jennergren [Ref. 11] concluded that simulation programs written in PASCAL average twice the length of their simulation language counterparts. Emshoff and Sisson [Ref. 9: p. 117] estimate the savings in model development effort resulting from the use of simulation languages to be on the order of a factor of 10. Several factors contribute to the programming convenience of simulation languages. The subroutines provided as standard features of simulation languages provide programmers with simple tools to represent simulation-unique functions and concepts. The ease with which simulation languages define classes of system entities, differentiate among entities within those classes and permit adjustment of the number or type of entities in the system is also helpful. The convenience of simulation languages is not achieved without sacrifice. The structuring of entities and activities in simulation languages increases their flexibility in that changes to the system require only simple modifications to the program. These generalized structures, however, limit the ability of simulation languages to represent system detail. Though simulation languages automatically collect and display data generally desired by analysts, they are less flexible than general purpose programming languages with respect to the variety of output formats. Finally, programs written in simulation languages can expect to experience slower execution times than general purpose language programs.

The initial concern of most organizations in the process of selecting a simulation language is ensuring that the chosen language is compatible with installed hardware and that its use is within the capability of the organization's analysts. Other questions should be answered in the second phase of the selection process. The relative ease of learning, availability of users manuals, machine

portability, quality of error diagnostics, language efficiency and cost of the languages under consideration should be explored. Finally, the ability of the chosen simulation language to naturally describe the system in question should be studied. The suitability of a simulation language to a given problem may be assessed by examining its "world view."

The world view of a simulation language is the way that it conceptualizes the entities of a system, the attributes that further describe those entities, and the interaction between those entities and the activities of the system [Ref. 12: p. 17]. World views of simulation are grouped into two schools of simulation thought, one emphasizing the use of flowcharts to describe models, the other relying on program statements.

Flowchart languages are regarded by users as somewhat easier to learn and interpret, while statement oriented languages are more flexible [Ref. 12: p. 18]. Statement oriented languages are characterized by three world views--activity, event and process. Flowchart oriented simulation languages adhere to the transaction world view. The transaction world view models systems by tracing the flow of transactions through specialized activity blocks. Simulated time advances as transactions pass through the blocks which are used to represent actual processes or real system decisions. Users familiar with flowcharting techniques and the system being modeled find the transaction view convenient to use and easy to learn. IBM's GPSS is the predominant language in this category.

D. GPSS

The transaction world view of GPSS is structurally similar to the complex queuing problems posed by requisition flow in a supply depot. GPSS uses block diagrams to visualize transactions moving from process to process within the

system. Each GPSS block is implemented by a code segment representing an action relative to the system simulation. The close relationship between the block diagram and program code to the logical structure of the system being simulated makes GPSS easy to use. System throughput, resource utilization and queuing statistics collected as standard features of GPSS may be tailored to support the information requirements of the logistics planner.

GPSS is particularly attractive to the inexperienced user. The block diagram structure reduces the complexity of model development and communicates an understanding of the simulation program to users. Statistics gathering and display require minimal effort on the part of the user. Because GPSS is the most popular and widely used simulation language [Ref. 13], numerous companies market GPSS products and provide comprehensive documentation. In addition several academic texts on GPSS have been published, offering another source of information to users.

Minuteman Software has developed a microcomputer version of GPSS, marketed under the name of GPSS/PC, to take advantage of the increased CPU and memory capacities of modern microcomputers. Designed for use on IBM compatible microcomputers, the structure and syntax of GPSS/PC are nearly identical to that of the mainframe version, enabling it to retain its attractiveness as a discrete event simulation language. The primary advantages of using a simulation language designed for the microcomputer are reduced software expenses and the convenience to the analyst of working on a dedicated microcomputer. While the general design of GPSS/PC is suited to the simulation of supply depot operations, it is constrained by its inability to to address more than 640 kilobytes of random access memory, a limit shared by all applications programs running on IBM's Disk Operating System (DOS). Due to this inherited limitation, GPSS/PC is not

useful in the simulation of large queuing systems such as NSD Yokosuka.

Discrete event simulation, utilizing GPSS, could be effectively used to support logistics planning efforts of NSD Yokosuka. Note the following points:

1. Issue processing procedures at NSD Yokosuka are permeated with the type of queuing phenomena that discrete event simulation languages, GPSS in particular, are designed to model.
2. The standard format of discrete simulation output is suited to the information requirements of Depot planners.
3. Experimentation, including minor modifications, with existing simulation models is within the capability of analysts in the NSD Yokosuka Planning Division.
4. The block diagram structure of GPSS improves user understanding of program structure, easing the process of making program modifications required by changes in NSD facilities or procedures.
5. Owing to its popularity, GPSS documentation, training, and technical assistance are all readily available to the NSD

While discrete event simulation can be a useful tool to logistics planners, its disadvantages must also be recognized. Drawbacks to the use of computer simulation in logistics planning include:

1. Validating a simulation model requires substantial effort and is a continuing process as the model must be maintained to reflect real system changes. If the basic model does not accurately reflect actual system operations or supporting data is erroneous, simulation results will not be useful.
2. Though experimentation and minor modifications are within the capability of NSD Yokosuka personnel, major revision would require outside training or assistance.
3. Because the simulation model is a simplification of the actual system, detail useful to planners is lost. In addition, limiting the scope of the model leaves planners without information on other essential Depot functions.

The practical limitations of discrete event simulation must be accepted before it is employed as a logistics planning tool. In combination with other operations research techniques, discrete event simulation using GPSS can be an effective method of forecasting NSD Yokosuka performance under conditions of surge demand.

III. THE SYSTEM TO BE MODELED

NSD Yokosuka's main administrative offices and storage facilities are located on U. S. Naval Base Yokosuka, of which the NSD is a tenant activity. Figure 3.1 shows the physical layout of NSD facilities on Naval Base Yokosuka. Yokohama Cold Storage, located approximately 20 miles from Yokosuka, is the only modeled activity of the NSD not located within the confines of Naval Base Yokosuka.

NSD Yokosuka has 54 U. S. Civil Service and 905 Japanese National employees in addition to the 176 military personnel authorized. Normal working hours are 0800 to 1645 Monday through Friday with a 45 minute lunch break. Non-duty hour processing of issue priority group one (IPG1) requisitions and IPG2 bearer walkthrough and Casualty Reporting System (CASREPT) requisitions is handled by the duty section on weekends and by the Customer Services Division evening and midnight shifts during the week. DPSC maintains seven day a week, around-the-clock computer center operations in support of issue processing.

The Depot receives an average of 43,000 requisitions a month, of which approximately 90% are for standard stock items. Of the total demand for standard stock items, NSD Yokosuka typically makes 30,000 issues per month from its $43,000,000 inventory of over 78,000 line items. 75% of those issues are for material stored in the general storage locations of the Depot. The remaining 25% are for provisions stored in Yokosuka Cold Storage (Building 1390), Yokosuka Dry Storage (B-47) and Yokohama Cold Storage.

Figure 3.2 is a basic flow diagram of NSD Yokosuka issue operations. Requisition input to the system arrives in two forms, hard copy or online. Online requisitions are received via Automatic Digital Network (AUTODIN), Disk

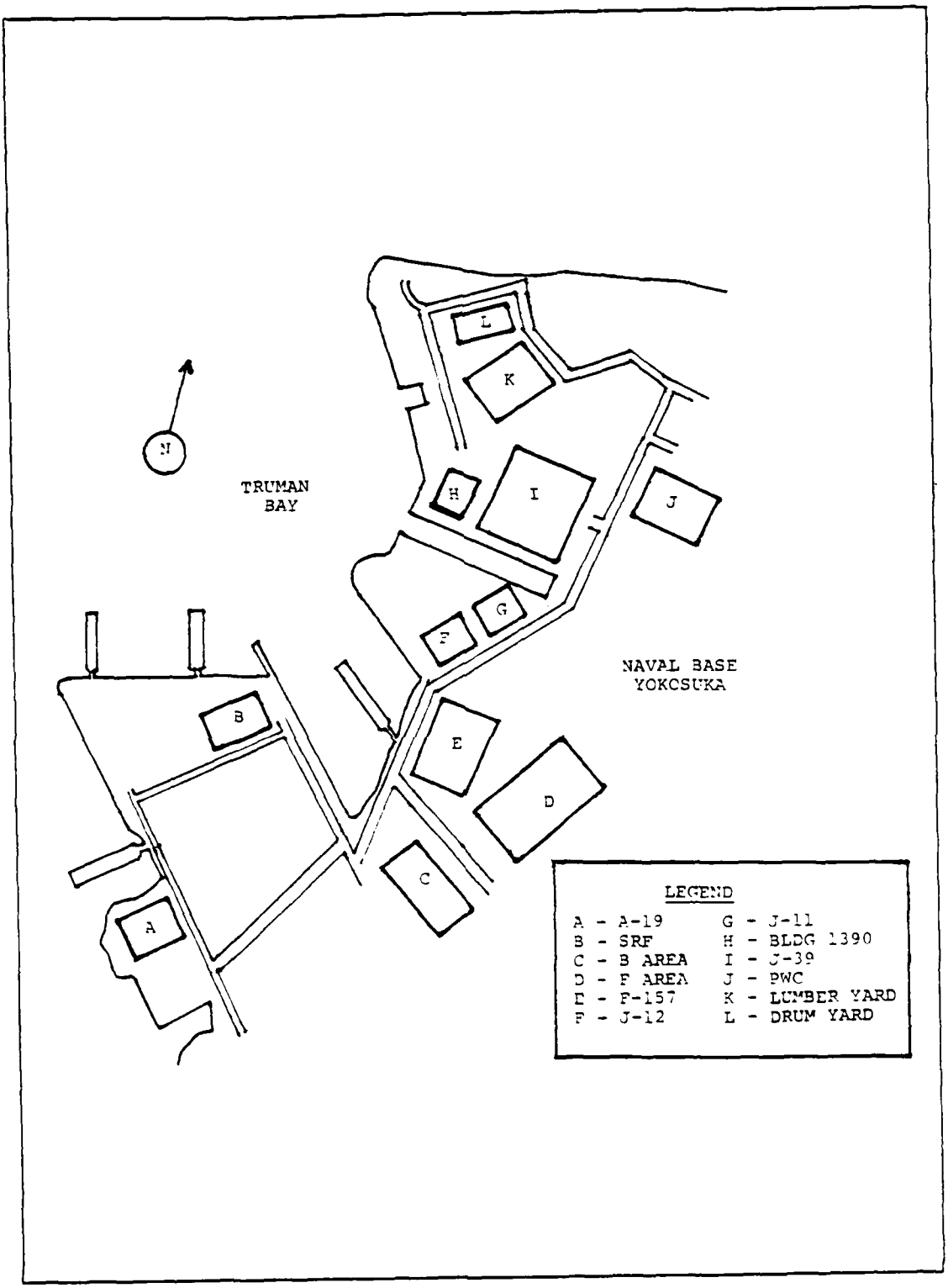

Figure 3.1 Physical Layout.

Oriented Supply System (DOSS) and local customer remote terminal entry. The requirements of activities without installed remote terminal entry equipment and all perishable provisions (9MP/9MB), ships store stock (1Q) and bearer requisitions are received in hard copy form. Requisitions for 9MP, 9MB and 1Q material are initially routed to the Requirements Division for stock check. IPG1 requisitions, IPG2 bearer walkthrough, CASREPT and quick pick requisitions and all 9MP, 9MB and 1Q requisitions (regardless of priority) received by NSD are entered via remote terminal in Customer Services. All other requisitions are transferred to DPSC for entry. Requisitions are handled throughout the Depot on a first come, first served, within priority level basis. Priority levels, from highest to lowest, are as follows:

1. IPG1 bearer walkthrough all other IPG1
2. IPG2 bearer walkthrough
3. IPG2 CASREPT (not bearer walkthrough)
4. IPG2 quick pick
5. all other IPG2
6. all IPG3

Regardless of their origin, all IPG1, CASREPT, bearer walkthrough, quick pick, dry provisions (9MF) and 1Q requisitions wait in a queue file to be processed by Uniform Automated Data Processing System (UADPS) programs UC02 and UC96. The queue file is emptied frequently (every 5 minutes) into UC02/UC96 for processing. Issue documents for material determined to be in stock are output immediately in Customer Services. 9MP and 9MB requisitions are entered under local procedures and issue documents are printed on the Customer Services printer. The balance of IPG2 and all IPG3 requisitions are processed in batch mode by UC02/UC96 and local programs LC06, LC07 and LC08. Issue documents for material determined to be in stock are output in Storage Control.

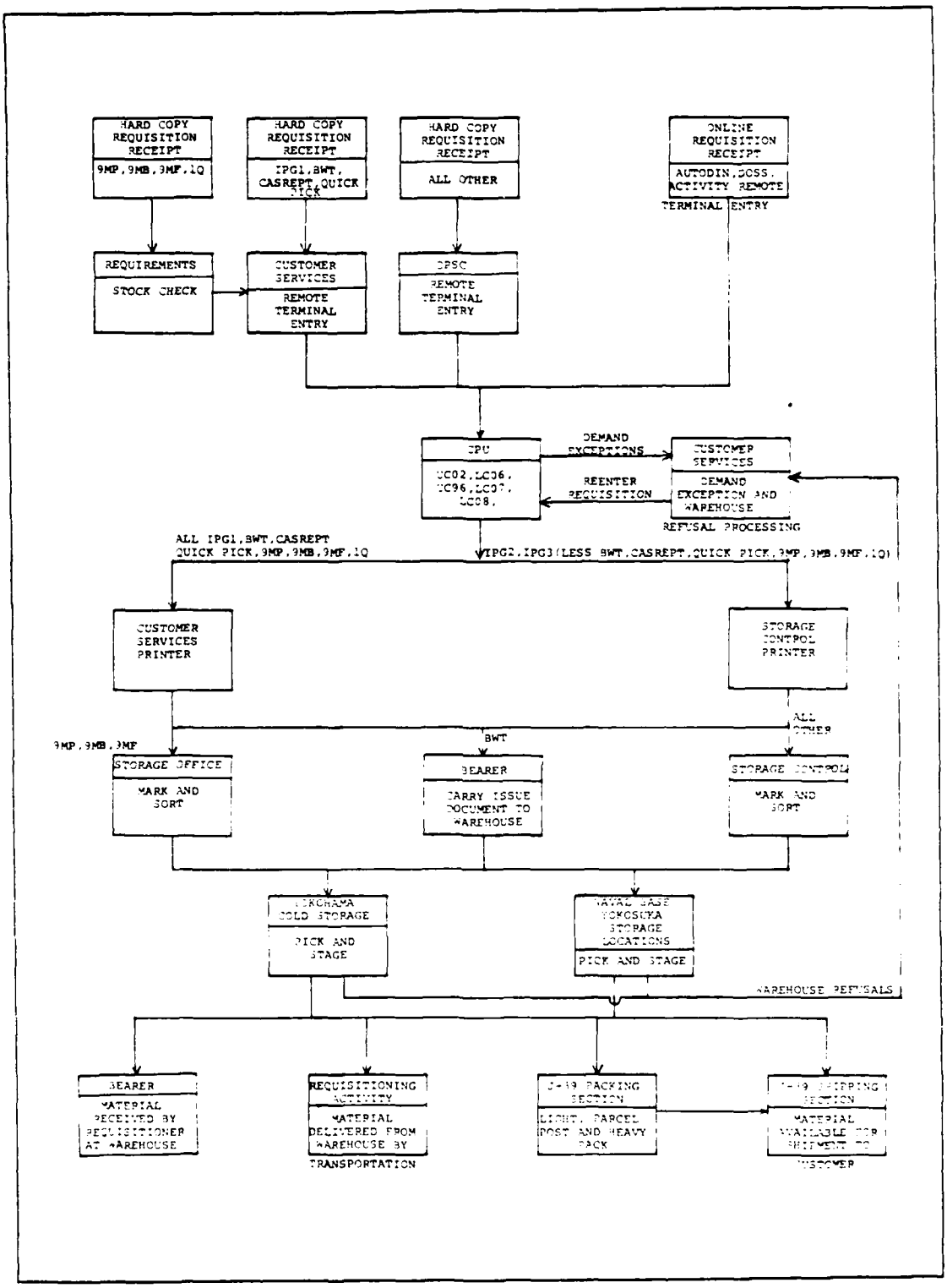

Figure 3.2 Flow Diagram.

Issue documents for provisions are output in Customer Services. Demand exceptions are reviewed by exception clerks in Customer Services and re-entered into the system.

All issue documents printed in Customer Services are annotated or stamped as appropriate (quick pick, CASREPT, etc.) and are routed for further processing. Provisions issue documents are delivered to the Storage Office. Issue documents produced for bearer walkthrough requisitions are released to the bearer to be hand carried to the warehouse storing the material. All other issue documents are delivered to Storage Control.

Storage Control personnel sort those issue documents printed by the Storage Control printer and those received from Customer Services by warehouse and deliver the document batches by bicycle messenger to their respective storage locations. Provisions documents received in the Storage Office are also sorted by storage location. Issue documents for provisions in Building 1390 and B-47 are delivered by the bicycle messenger. Issue documents for perishable provisions stocked in Yokohama are delivered by a truck that leaves Yokosuka at 0900 on workdays, arriving in Yokohama later the same morning.

Upon receipt of issue documents, warehouse personnel pick the requisitioned material, attach copies of the issue document, and segregate it by destination. In general storage locations, material is staged separately for delivery to the Publics Works Center (PWC), the Ship Repair Facility (SRF) and the Packing and Shipping Sections of the Freight Terminal. In provisions warehouses, the majority of material is staged within the facility to be delivered directly to the requisitioner. Provisions issues for off-base delivery or bearer pick-up are staged separately. All bearer issues are turned over to the customer at the warehouse. Warehouse refusals are annotated as such on issue

documents which are returned to Customer Services for processing (i.e. investigation, transaction reversal, referal or cancellation).

Material segregated for delivery in general storage locations to PWC, SRF, or the Freight Terminal is transported by Labor and Equipment Division tractor trains to its next destination. Tractor trains run on two separate routes at 0815, 1015,1300 and 1400 on workdays. Material requisitioned by PWC and SRF is delivered enroute to Building J-39. All material requiring packing prior to shipment is unloaded in the Packing Section of J-39. The remaining material is delivered to the Shipping Section. Tractor trains run on an as required basis to deliver provisions from B-47 and Building 1390 to the Freight Terminal.

Material transported to the Packing Section is packaged for further transportation to the customer. Three basic types of pack are used--light, parcel post or heavy--as appropriate to the material. When packing is completed the material is delivered to the Shipping Section, adjacent to the end of the packing line, for further processing.

The Uniform Material Movement and Issue Priority System (UMMIPS) treats issues received in the Shipping Section as available for shipment to the requisitioner and issue processing statistics maintained by the Depot do not record handling time in the Shipping Section. Shipping Section operations, beyond receipt of material, are not modeled in the simulation program.

IV. THE MODEL

A. DEFINITION

The computer program is written in IBM's GPSS V. The program simulates all NSD Yokosuka functions that directly support issue processing operations, from requisition receipt to the point of availability of the issue for shipment to the requisitioner. Specific functions simulated are:

1. Requirements Division stock check of perishable provision and ships store stock requisitions.
2. Customer Services and DPSC remote terminal entry of hard copy requisitions.
3. Customer Services demand exception and warehouse refusal processing
4. Customer Services and Storage Control issue document printer operations
5. Storage Control and Storage Office sorting and handling of issue documents
6. Delivery of issue documents to Yokohama Cold Storage and Naval Base Yokosuka storage locations
7. Warehouse pick and stage operations (and shipment preparations in provisions storage locations)
8. Tractor train delivery of issues to SRF, PWC and the packing and shipping sections of the Freight Terminal
9. Packing operations
10. Duty section and late shift operations

A copy of the program code is provided as Appendix A. Listings of program variables, functions, transaction parameters and storages referenced during the simulation are all included in the program code. A GPSS block diagram of the program structure is provided as Appendix B. The succeeding section refers to segments of the GPSS block diagram to relate the structure of the simulation program to actual Depot operations.

B. STRUCTURE

GPSS simulates actual system performance by generating requisitions (referred to as transactions) at time intervals modeled after real system arrivals and permitting the generated transactions to proceed through block paths representing real system processes. Each GPSS block executes a subroutine which may delay, modify, remove or control the flow of the entering transaction. In a large system composed of separate workcenters, such as NSD Yokosuka, transactions move through a varied series of processes before an issue results. Although these processes differ physically, many are logically similar (e.g., transactions enter a workcenter, wait for service, are processed and then leave the workcenter for the next processing step). Consequently, GPSS is able to simulate a wide variety of processes with a relatively small vocabulary of blocks.

GPSS can also generate control transactions in separate modules to alter system status (i.e., control storage availability, trigger scheduled events). The generation of control transactions and their flow through the program blocks is timed to coincide with operating schedules of the Depot. Time is divided into units of .01 hours in the simulation. The reader is therefore reminded to carefully interpret simulation time in the program (i.e., 30 minutes is represented as 50, 8 hours and 45 minutes as 875, etc.).

This section of the chapter groups logically similar processes into categories and references modules in the GPSS block diagram in Appendix B to demonstrate how actual processes are modeled in the program. All GPSS blocks discussed in this section appear in upper case to set them apart from the text. Assumptions made in modeling the real system processes are presented as are special programming details that may not be apparent to the user. An understanding of this section will improve the reader's

comprehension of the program code. It will also serve to assist the user in making program changes for the purpose of system experimentation or reflecting real system changes.

1. Requisition Generation

Requisition generation and priority assignment is modeled in the requisition generation module of the program. GPSS V limits each model to 32,767 concurrently active transactions. To remain within that limitation during simulation experiments, the number of transactions generated has been reduced by structuring the program to permit a single transaction to represent three requisitions. All succeeding program modules, with the exception of the duty section module, process each transaction as if it were 3 separate requisitions to maintain an operational pace equivalent to actual Depot operations.

The number of demands generated in one week of simulated time is computed by multiplying the monthly demand level input by the user by a factor of .231 (based on an average of 4.33 weeks per month). The daily distribution of those demands is determined by function FTHNN which is derived from daily demand data supplied by the NSD. The daily demand level is then divided by 3 to obtain the number of transactions generated during each simulated day.

Daily requisition arrival rates utilized in the simulation are constant over the weekend, but are computed to force generation of 89% of weekday demands during normal operating hours, consistent with the pattern of workday requisition arrivals actually experienced by the Depot. As data supporting an alternative distribution of requisition arrivals is not available at this time, transactions are allowed to proceed into the model at a uniform rate. Although the clumping of requisition arrivals expected during actual operation is not duplicated, requisition flow similar to that experienced by the NSD is restored early in

the requisition processing cycle by the simulation of the batch printing of issues documents in the printer queue handling module.

The first three requisition generation subsections of the requisition generation module are responsible for generating requisitions on weekdays--before, during and after normal operating hours respectively. The fourth requisition generation subsection generates weekend arrivals. The GENERATE block in each subsection creates a single transaction each simulated day at the beginning of its assigned time period (i.e., 0001 for the AM subsection, 0800 for the operating hours subsection). Because all of the requisition generation subsections create a single transaction each day of the week, transactions generated in the weekday generation subsections must be terminated on weekends and transactions generated in the weekend generation subsection must be terminated on weekdays. The TEST blocks permits the generated transaction to proceed on workdays in the first three subsections and on weekends in the last subsection. Transactions failing that test are transferred to the TERMINATE block labeled RQTRM and removed from the model.

All transactions that are not terminated continue through the requisition generation subsections. The SPLIT and ADVANCE blocks combine to transform the previously generated single transactions into a uniform flow of transactions representing the arrival of requisitions at the NSD. Transactions entering the SPLIT block are split into the number of transactions expected during the period. The ADVANCE block then permits the newly created transactions to pass to the next block at a uniform rate, where they are transferred to the ASSIGN block PRIAS. The ASSIGN block references function FONE and stochastically assigns an integer value representing requisition priority to parameter 1 of each transaction. The following PRIORITY block copies

the parameter 1 value to assign transaction priorities referenced during program execution to determine processing order. All transactions are then routed by their parameter 1 value through a path of SAVEVALUE blocks that serve as requisition counters.

2. Work Scheduling

Operating schedules for Depot workcenters during the normal workday, the late shift and duty section, the issue document printers and the tractor trains are all managed by control transactions in schedule control sections. With the exception of normal workday scheduling, which is controlled in separate modules, all schedule control sections are located in the module whose operations they control.

As an example of how work scheduling is managed by the program, the schedule control section of the duty section module is explained below. The first block in the section generates a control transaction at the beginning of each day. On weekdays the control transaction proceeds through the module, alternately entering ADVANCE blocks to simulate the passage of time and UNLINK blocks positioned to coordinate the flow of transactions with the operating status of the duty section. After 1675 time units have passed, marking the end of the normal workday at 1645, the control transaction is terminated and the process is repeated at the beginning of the next simulated day. On weekends the control transaction is routed directly to the TERMINATE block labeled DTEND and removed from the model, permitting the duty section to remain in continuous operation over the weekend. Scheduling of the issue document printer and tractor train operations differ only in that control transactions are created at more frequent intervals during the day to trigger the repetitively scheduled processes.

3. Workcenter Operations

NSD workcenters supporting issue processing operations are represented throughout the program as storages. A storage is an entity provided by GPSS to simulate homogenous parallel servers, that is, personnel working side by side performing similar duties at similar rates of speed. Each storage referenced in the simulation is included in the storage definition section where its symbolic name, capacity and description is provided. Storages that have been thus defined may then be referenced in the program to simulate the actual processing of requisitions.

SKCK is the symbolic name of the storage referenced by the requisition receipt module. It simulates the stock check of perishable provision and ships store stock requisitions in the Requirements Division and has a defined capacity of two personnel. Storage references are commonly accompanied by two block pairs, QUEUE/DEPART and ENTER/LEAVE. The function of the QUEUE and DEPART blocks is to collect statistics regarding the time spent by transactions waiting for the storage to become available and related queue data. The ENTER and LEAVE blocks perform the function of controlling access to the ADVANCE block, limiting its current contents to the defined capacity of the storage. After a simulation is run, statistics detailing the time spent waiting for service and the active processing time at each defined storage are presented. See Chapter V for a more detailed description of output statistics.

The time that it takes to process a single transaction in the Requirements Division is simulated in the ADVANCE block labeled SKCK. The ADVANCE block delays each transaction for an explicit period of time equal to the value of the variable V$SKCKS named in the A operand. In recognition of the fact that each transaction represents 3 requisitions, the service times used in the model are

computed by summing 3 individual service times. Individual service times are drawn from functions containing frequency distributions of service times observed during actual operations at NSD Yokosuka. The service times of workcenters for which frequency distributions were not available to the author are computed from mean service times provided by NSD and are assumed to follow the negative exponential distribution. These included all provisions storage locations and the main warehouse (F-157). Mean service times were also used for all Requirements Division, Customer Services Division, Storage Office and Storage Control requisition and issue document handling processes due to the brief and uniform nature of those functions. Mean service times were not available for packing operations, so Packing Section service times employed in the model were computed by dividing the manhours recorded for each pack type on the NSD Yokosuka Uniform Management Reports by the number of issues packed.

4. Requisition Flow Control

Most modules modeling workcenter operations begin with flow control sections that serve two primary purposes. First, program execution efficiency is improved by placing transactions that are about to attempt entry into a storage on a "user chain" until the storage has available capacity. Managing waiting transactions in this manner frees the computer from continuously scanning each transaction attempting to enter a storage. Secondly, the unlinking of transactions from user chains at the end of the workday provides positive control of high priority requisitions that require transfer to the duty section module for processing after normal operating hours.

Though flow control sections in the program differ slightly in structure, the flow control section in the Requirements Division module is representative of the basic

structure employed throughout the program. The first three TEST blocks following SKCKQ route transactions that have joined the queue. Transactions entering during lunch are transferred to the LINK block labeled SKCKL where they are placed on the user chain SKCKC. Transactions entering outside of the normal workday are transferred to the TEST block SKCKT which routes transactions based on their priority. High priority transactions (those handled by the duty section) are assigned a progress indicator in parameter 3 that marks their stage in processing. They are then removed from the QSKCK queue and are transferred to the duty section module for processing. Low priority requisitions (those not handled by the duty section) are transferred to the advance block labeled SKCKA where they are delayed a single time unit to avoid an endless loop of linking and unlinking. The transactions are then transferred to SKCKL and placed on user chain SKCKC. Those transactions arriving during normal operating hours proceed directly to the ENTER block labeled SKCKE if the storage SKCK has remaining capacity. Otherwise, the transactions are transferred to SKCKL and placed on user chain SKCKC. Those entering during working hours when the storage has no available capacity proceed to the LINK block labeled SKCKL where they are placed on user chain SKCKC.

During normal operating hours one transaction is unlinked from the user chain to enter the storage for each transaction leaving the storage, maintaining full utilization of the storage as long as transactions remain on the user chain. All transactions are unlinked from user chain SKCKC at the end of the workday by a control transaction in the schedule control module so that high priority transactions residing on the user chain may be identified and routed to the duty section module. Low priority requisitions are relinked to user chain SKCKC to await processing during the next scheduled workday.

5. Printer Operations

The NSD Yokosuka issue document printers are currently located in DPSC and Customer Services. However, the modeling of printer operations in the program reflects NSD Yokosuka plans to relocate the DPSC printer to Storage Control in Fiscal Year 1986.

Customer Services printer operations including the schedule control section are modeled in the printer queue handling module. IPG1, IPG2 (CASREPT, quick pick and bearer walkthrough) and all provisions transactions are routed to the block labeled CSPRQ and placed in the QCSPR queue. The LINK block places all transactions on user chain ONE. The transactions are released at simulated time intervals of 5 minutes by the UNLINK block labeled UNLNK in the schedule control section, matching queue file processing procedures followed by UC02/UC96. The "printed" transactions are removed from the QCSPR queue by the DEPART block. They proceed through ENTER and LEAVE blocks referencing the CSPR storage without an intervening advance block because the processing delay actually experienced by requisitions waiting for UC96/UC02 to empty the queue file is simulated by the delay on the user chain.

6. Transportation Operations

Issue processing functions of the Depot include the transportation of issue documents and material between stationary workcenters. The programming technique used to simulate transportation processes involves linking transactions to user chains and using control transactions generated in corresponding schedule control sections to unlink them to succeeding modules. Transportation processes that, in actual operations, are essentially without maximum capacities are modeled as such (e.g., the number of issue documents that may be transported to Yokohama Cold Storage during a single delivery run is essentially unlimited).

Modeling transportation processes with known capacities is more complex.

Operations of the "B" route tractor train are simulated in the tractor train delivery module. Control transactions are created in the schedule control section at simulated times corresponding to the actual train schedule and are transferred to the UNLINK block LOADB on workdays. The loading of IPG1 and IPG2 transactions on the tractor train is managed by LOADB and the succeeding UNLINK blocks in the loading section which release all transactions on the JCF, BCH and ACH user chains to the test block BTEST in the operations section.

The operations section controls transaction access to the tractor trains. BTEST permits IPG1 and IPG2 transactions to proceed to the following TEST block. The weight of each transaction is then checked to ensure that it does not exceed the remaining capacity of the storage BTRN. Transactions meeting that test are transferred to BTRNE to enter the storage (i.e. are loaded on the train), depart QBTRN in the following block and are linked to user chain BTRNC in the succeeding LINK block. All IPG3 transactions and those transactions whose weight exceeds the remaining capacity of the storage (signifying that the train has been loaded to capacity) pass through the following ADVANCE block and are transferred back to their respective warehouse module to await the next train. By screening IPG1 and IPG2 transactions in advance of the normal loading cycle, IPG3 transactions at the first tractor train stop are prevented from effectively denying transportation to IPG1 and IPG2 transactions at later stops. This is consistent with tractor train loading procedures of NSD Yokosuka.

The succeeding blocks in the loading section govern the loading of IPG3 transactions returned to the warehouse. The control transaction passes through an ADVANCE block

which delays it to simulate movement of the tractor train from J-39 to its first stop, J warehouse area. The following UNLINK block releases, in priority order, all transactions waiting on user chain JCH to the TEST block BTRNT. The unlinked transactions are then loaded on the tractor train, capacity permitting, in the manner described by the previous paragraph. The control transaction continues through alternating ADVANCE and UNLINK blocks to repeat this process for transactions waiting at warehouse areas A and B.

After linking waiting transactions to the user chain BTRNC, the control transaction in the loading section enters an ADVANCE block which delays it to simulate movement of the train to the first unloading points, PWC and SRF. When the control transaction enters the succeeding UNLINK block, all transactions on the user chain BTRNC leave the storage BTRN and proceed to the TEST block TMTST. Transactions with a parameter 4 value indicating delivery to PWC and SRF are transferred for termination simulating delivery to requisitioner. All other transactions are delayed by an ADVANCE block to simulate transportation to the Freight Terminal.

7. Duty Section Operations

The flow control sections throughout the program are designed to forward IPG1 and IPG2 CASREPT and bearer walkthrough transactions to the duty section module at the end of the workday and on weekends. Processing steps in the duty section module are similar to normal workday procedures except that all transactions are stock checked before remote terminal entry and transportation delays are modeled to recognize the fact that requisitions handled by the duty section are processed continuously from receipt to issue. Additionally, all 9MP and 9MB issues are made from Building 1390, as nearly all after hours provisions issues made by NSD Yokosuka are for requisitions received from inport ships.

So that transportation delays due to single issue processing by the duty section are accurately modeled, each transaction (representing three requisitions at this point) entering the storage DUTY is split into three identical transactions, each representing a single requisition. The number of transactions that may be simultaneously processed in the duty section module is limited to the duty section storage capacity of 2 which is consistent with the number of personnel actually available in the late shifts and duty section to handle issues.

The storage DUTY is unique in that it has several ADVANCE blocks between the ENTER and LEAVE blocks, each representing a step in actual issue processing. The first block in the operations section joins all transactions to the queue DUTYQ. The succeeding TEST blocks send entering transactions directly to the block labeled DUTYS if the storage DUTY has available capacity. Those entering before 1646 on workdays or when the storage is full are linked to the user chain DUTYC to await processing.

Transactions transferred directly, as well as those unlinked from user chain DUTYC for processing, proceed to the SPLIT block labeled DUTYS. There, each transaction is split into 3 separate transactions, each representing a single requisition as previously explained. The following TRANSFER block sends the original transaction directly to the ENTER block DUTYE. The newly created transactions are first transferred to QSPLT to be joined to DUTYQ before proceeding to the ENTER block. Transactions proceed beyond the ENTER block as the defined capacity of DUTY permits. They are removed from DUTYQ in the next block and then transferred to the starting point in the duty section module appropriate to the progress indicator stored in parameter 3.

The complete processing of each transaction is then simulated as the transaction passes through the remainder of

the module blocks. When processing is completed, each transaction passes through the dummy ADVANCE block labeled DUTTR, placed to provide a count of leaving transactions that is referenced by the following TEST block. The TEST block allows every third transaction to pass through the next block which unlinks a single transaction (representing 3 requisitions) to DUTYS. The above process is then repeated for the unlinked transaction.

The TRANSFER block SEND transfers transactions that complete processing in the duty section module to termination blocks appropriate to each transaction. At the start of the following workday, any unprocessed transactions remaining on the user chain DUTYC are unlinked to DUTYD by a control transaction in the schedule section. Those transactions are removed from DUTYQ and transferred back to their point of origin indicated by parameter 3. The processing of all transactions that have been split into individual requisitions is completed in the duty section module.

V. VERIFICATION AND VALIDATION

A. INTRODUCTION

This chapter will review verification of the program structure and discuss procedures to be used in the validation of simulation results. Verification and validation are terms used to describe the process of establishing the credibility of simulation models. The verification process entails ensuring that the logic of the computer program corresponds to that of the real system. Validation takes the process a step further, by testing the model to determine if it reasonably reflects real system processes.

Program output used during verification and validation is produced at the end of the simulation. The output is divided into 4 "snapshots" presenting a set of cumulative statistics at the end of each simulated week. The final snapshot of the program output used to verify this model is provided as Appendix C. The sections listed below are of particular interest:

1. Queue statistics
2. Storage statistics
3. Savevalues--total requisition generation count (REQCT), requisition generation count by issue priority group (PRONE, PRTWO and PRTHR), NIS requisition count (NISCT), warehouse refusal count (WRCT) and tractor train run count (ANUM, BNUM and PNUM)
4. Tables--throughput time distribution for all issues (ALL) and throughput time distribution for issues by issue priority group (IPGON, IPGTW, IPGTH)
5. Block counts

Storage statistics provide information regarding the active processing time experienced by transactions (requisitions) during the simulation as well storage (workcenter) utilization information. For each storage defined in the model, GPSS provides standard output that can be used to study system performance. Storage names and capacities are

provided under the corresponding headings. The total number of transactions processed during the simulation may be found in the column labeled "ENTRIES." The average processing time for those transactions that have been processed should closely approximate the mean of the service time data supplied to the program and may be verified by examining data in the column headed "AVERAGE TIME/UNIT". Statistics measuring storage utilization during operating hours are of particular interest to the user. The percentage of time that a storage is available for normal operations is given in the column "PERCENT AVAILABILITY" (e.g., the storage SKCK available 23.8% of the time or .238 X 168 hours = 40 hours per week). During this period of availability, average utilization may be found under the "AVAIL. TIME" heading. For the storage SKCK, this value was .135 or 13.5%

Queue statistics detail the waiting times experienced by transactions attempting to enter storages in the model. They are provided immediately following storage statistics in a similar format. The maximum, average and total number of requisitions awaiting processing in each of the queues listed in the first column are provided in the next three columns. The column headed "AVERAGE TIME/TRANS" provides the average time spent waiting for processing by all transactions joining the queue. This information is used to isolate delays in transaction processing and is particularly useful during experimentation in identifying system "bottlenecks."

Savevalues are employed as "counters" during the simulation. Savevalues tally the total number of transactions entering the system and provide subtotals by issue priority groups. They are also used to count NIS and warehouse refusal transactions experienced during the simulation. During validation, the output values for savevalues defined in the program may be compared to input parameters to verify

the demand level and mix, acting as a yardstick for evaluating system performance.

Tables defined in the program are designed to provide system throughput data that may be compared to Uniform Material Movement and Issue Priority System (UMMIPS) statistics maintained by the Depot. Tabulate blocks are positioned in the termination module to collect statistics at the point of issue or availability for shipment. The system entry time of each transaction entering a TABULATE block is subtracted from the current simulation clock time, recording the difference as the total issue processing time. The elapsed processing times of all transactions representing issues are aggregated and presented as a frequency distribution table.

The first row of data in each table presents the total number of transactions tabulated, the mean throughput time and the standard deviation. In the body of the frequency distribution table, the data is grouped into predefined intervals whose upper limits are listed in the first column. Because simulated time in the model is based on units of .01 hours, the listed upper limits must be divided by 100 to obtain the correct time in hours. The frequency of occurrence, percentage of total occurrences and cumulative percentage of occurrences in each interval are presented in the next three columns. As in the savevalue output section, one table is used to tabulate all transactions leaving the system and three separate tables present tabulations for the three issue priority groups.

While the block count section of the program does not provide useful information during the validation phase, it is a valuable tool during verification to review transaction flow. A current and total transaction count is provided for each block in the program. This data can be compared to corresponding block operands, especially flow control blocks

like TEST or TRANSFER, to ensure that program logic is consistent with real system operations.

B. VERIFICATION

Steps in the verification phase are designed to expose coding and logic errors. Transaction generation and flow are reviewed using block count and savevalue statistics to verify that the characteristics of requisition flow at NSD Yokosuka is duplicated by the simulation model. The verification phase was completed using the final snapshot in the output listing provided by Appendix C.

The savevalue REQCT counted 39,780 transactions entering the model during the four weeks of simulated operations conducted at a monthly demand level of 43,00 requisitions. Assuming 4.33 weeks to the month, the entry of 39,692 transactions ((43,000/4.33) X 4 weeks) would have been expected. The difference between the requisition receipt rate experienced from that expected is due to truncation during GPSS variable computation and may be compensated for by slightly increasing the demand level.

The characteristics of transactions entering the system were also reviewed. Block counts of the SPLIT blocks in the workday requisition generation subsections were used to compute the percentage of transactions entering during the normal operating hours of the workday. 89% of all workday transactions entered the model during the simulated time period of 0800 - 1645, matching the pattern of real system arrivals. Priority assignment recorded by the savevalues PRION, PRITW and PRITH were compared to the priority assignment input data in function FONE. The recorded number of transactions in each priority group matched expected results.

Requisition flow points representing the routing of online requisitions, perishable provisions requisitions stock checked in Requirements Division, demand exceptions,

NIS requisitions and warehouse refusals were all verified by reviewing block count statistics. All observed counts differed from expected values by less than 1% with the exception of the warehouse refusal count. The difference in warehouse refusals observed from the number expected was 4% and is attributed to the smaller sample size of 67 warehouse refusals.

Warehouse location assignment in the model is handled by the ASSIGN block labeled LOCAS in the warehouse assignment module. A temporary TABULATE block was inserted following LOCAS to determine and verify the assignments to each warehouse area. Observed differences from expected assignments ranged from .01% to 13%. Fluctuations in warehouse arrivals of this magnitude are exceeded by those experienced in normal Depot operations and do not result in appreciable differences in simulation results.

C. VALIDATION

Service time observation data necessary to validate this model is not available to the author. Before validation of the model can begin, frequency distributions of observed service times in F-157, all provisions storage locations and the packing section must be completed and entered as functions in the model. After all of the data distributions are established and verified in the models, the following validation procedure should be used.

In the validation phase, the credibility of the model is established by developing a set of actual performance statistics to compare to queue storage and table statistics produced by the program. Depot performance statistics from a period of at least one month of normal operating tempo should be collected to provide both the demand level to be simulated and the real system performance data used to judge model performance.

The first step in validation should be to review overall system performance. Problems observed in this step will serve as starting points in the identification of module-level problems. Statistics reported by NSD in the Issue Processing Analysis Section of the Supply Distribution and Inventory Control Report (NAVSUP 1144) should be compared to the IPGON, IPGTW and IPGTH tables in the output section of the program. More specifically, for each issue priority group, the cumulative percentage figure for the interval with the upper limit matching the corresponding UMMIPS processing time standard (one, two and eight days respectively) should be compared to the percent shipped on time figure reported on the NAVSUP 1144. Three different basic observations may be made at this point.

1. Simulation throughput time statistics closely approximates real system performance
2. Simulation throughput time statistics differ from real system performance uniformly across issue priority groups.
3. Simulation throughput time statistics differ from real system performance inconsistently across issue priority groups.

In the case of the first observation, remaining validation steps can be limited to a review of queue and storage program output sections. Observation of either of the other two results may require a detailed analysis of the input data used by the model (i.e., service times, storage capacities) and the program logic representing decision rules employed by NSD personnel.

If transaction throughput times by issue priority groups differ uniformly from real system performance, queue and storage data should be compared to corresponding workcenter workloads. For example, if simulated throughput times were uniformly slower than real system operation, queue "AVERAGE CONTENTS" and "AVERAGE TIME/TRANS" data should be examined. Queues reflecting high average contents and reporting long average time per transaction values relative to other queues

should be reviewed first. Conversely, storages reporting high "UTILIZATION DURING AVAIL. TIME" should be examined before storages reporting low utilization. Real system workcenter backlogs, utilization rates and throughput should be compared to data from the suspect queues and storages. Discrepancies identified between actual workcenter performance and corresponding queue and storage statistics will most likely result from understated capacities, overstated or poorly defined service times, or both.

When deviation from real system performance does not occur uniformly across issue priority groups, program logic based on decision rules provided by NSD Yokosuka may not accurately reflect actual operations. For example, if simulated throughput times for IPG1 transactions were significantly faster than real system performance, while IPG2 and IPG3 performance was substantially as expected, handling of IPG1 requisitions in the program should be reviewed. Code segments modeling UC02/UC96 queue files and special delivery of IPG1 issue documents missing normal delivery runs should be compared to real system decision rules. If this review fails to produce an explanation for the discrepancy, intermediate MARK and TABULATE blocks should be inserted to measure throughput time in smaller segments of the program by issue priority groups in an effort to localize the problem.

The validation procedures discussed above are by no means all inclusive, however, they should serve as a guide to the validation process. Simulation model validation is an iterative process. After identified problems have been corrected, the program should be run and the results compared again against real system performance data. When validation is completed, input parameters and output statistics should be retained as a baseline for model experimentation.

VI. EXPERIMENTATION

One major purpose of simulation is to perform experimentation that will provide predictive information regarding real system performance under controlled changes to the system and its conditions. Simulation experiments reviewed in this chapter were conducted for the purpose of demonstrating experimentation techniques. The baseline program used during experimentation models NSD issue processing operations under a normal load of 43,000 requisitions a month and is identical to the program listing provided as Appendix A. The baseline program output referenced is the program output included as Appendix C. As the baseline program has not been validated, it should be emphasized that the results of this series of simulation experiments are useful for illustrative purposes only.

Consider the following demonstration of experimentation procedures. NSD Yokosuka Planning Division analysts have estimated that the support of an additional Carrier Battle Group (CBG) under peacetime conditions would result in a 70% increase in requisitions received. The objective of this series of experiments was to observe simulated issue processing operations of NSD Yokosuka for a period of four weeks under those conditions. The information obtained from the experimental models could be used to estimate the additional resources the Depot might require to continue providing approximately the same level of support.

The experimentation plan calls for an initial run to simulate NSD operations at a monthly demand level of 73,100 requisitions to identify processing bottlenecks in the system. After evaluation of the initial run is completed, adjustments to the model will be made reflecting options that would be available to the Depot during actual operation

(i.e., additional personnel, shift changes, scheduling of additional tractor train runs.) After modifications to the model are completed, the simulation run will be repeated. The results of the second simulation will then be evaluated and the process will continue in an iterative manner until a satisfactory solution is obtained. This plan was executed and the results are explained below.

The throughput time tables, storage and queue statistics produced by the first experiment were compared to Appendix C. The percentage of issues, by issue priority group, made within UMMIPS time standards with UMMIPS performance statistics recorded during normal operating levels did not indicate a serious problem at first glance. IPG1 and IPG2 UMMIPS performance remained essential unchanged. The percentage of IPG3 issues made within the UMMIPS time standard of seven days (16,800 simulation time units) fell from 99.1% under normal conditions to 95.3%. The first indication of a problem was in the actual number of IPG3 issues. The 18,693 IPG3 issues recorded reflected an increase of only 9% over the 17,157 IPG3 issues made during the baseline experiment, though the number of requisitions received increased by 70%. A review of queue statistics explained the modest increase in IPG3 issues. Snapshot queue statistics confirmed that warehouse area A, the main warehouse, the B route tractor train and packing queues steadily increased in length indicating that arrival rates in those areas exceeded the service rates. This was confirmed by utilization rates in the corresponding storages approaching or equaling 100%. The Savevalue count BNUM (the B route tractor train count) underscored the issue transportation problem. The B route required 97 runs to transport issues from warehouse areas A, B, and J, exceeding the scheduled 80 runs by 21%.

Based on these changes in system performance due to the increase in load conditions, the "system" was modified in

the following manner. Since processing bottlenecks were localized in relatively few workcenters, spot adjustments, as opposed to blanket shift changes, were made to compensate for the additional workload. The warehouse area A and main warehouse storage capacities were increased from 2 to 3 and from 8 to 11, respectively. Each modification required a change to the capacity listed in the storage definition block and to the number of transactions unlinked in the user chain control module. The number of heavy pack crews was increased from 3 to 4 and the number of personnel in the light pack line was increased from 5 to 7 by changes to the program code similar to those made to the warehouse storages. Additional tractor train runs on the B route were scheduled at 1500 and 1700 each workday. A single additional run was scheduled on the A route to handle the anticipated increase in issues from the main warehouse. The changes were implemented by duplicating code from an earlier train run, changing only the control transaction generation time. The management discretion train routes previously scheduled for 1500 were rescheduled to 1800 by changing the control transaction generation times.

After the changes were completed, the second simulation experiment was run. The number of IPG1 and IPG2 issues and their UMMIPS performance statistics remained stable in the second run. IPG3 issues increased from 18,693 to 26,403, an increase of 41% over the previous experiment and 54% over the baseline issues. The percentage of IPG3 issues made within UMMIPS time standards increased to 97.1%. The storage and queue statistics of warehouse area A and the main warehouse were returned to acceptable levels by the capacity increases. The A route tractor train queue lengths recorded in the snapshot statistics produced during the second experiment increased only slightly, indicating that the single additional run scheduled was sufficient to handle the

increase in main warehouse issues that had been anticipated. The B route tractor train queue lengths showed significant improvement, however, the average transaction queue waiting time was an unacceptable 117 hours. Packing Section utilization remained at 100% with the increase in storage capacity partially offset by the increase in issues transported by the additional tractor train runs.

The results of the second run indicated that changes to the system were still required in the issue transportation and packing sections. In the third experiment, additional tractor train runs on the B route were scheduled at 0925 and 1125 on workdays to reduce the delay experienced by transactions waiting for transportation on the B route tractor train. The capacity of the heavy pack storage was increased from 4 to 5 and the light pack storage from 7 to 9. The simulation was repeated and results of third simulation experiment were examined. IPG1 and IPG2 statistics remained stable. The number of IPG3 issues rose to 28,683 with 97.8% of all issues made within UMMIPS time standards. All storage utilization rates had fallen sufficiently below 100% to eliminate the exploding queue characteristics observed in the previous experiments.

Experimentation could be continued to restore IPG3 UMMIPS performance standards observed in the baseline simulation by following the same procedures employed in the first three experiments. As observed during this series of experiments, obtaining the desired results is an iterative process. Modifications made to the model depend on the observed conditions unique to each experiment and are easily made by personnel with only a limited background in simulation techniques and GPSS.

VII. SUMMARY

A. CONCLUSIONS

1. Discrete Event Simulation Using GPSS V

Simulation using GPSS V can be an effective predictive tool for NSD Yokosuka planning personnel. The NSD is composed of interrelated queueing systems that may be accurately modeled by discrete event simulation techniques. The system throughput, resource utilization and queue statistics produced by GPSS V during simulation experimentation are well suited to the information requirements of logistics planners. Making program changes during system experimentation is a relatively simple process, well within the capability of personnel with only an introduction to GPSS.

2. Discrete Event Simulation Using GPSS/PC

NSD Yokosuka issue processing operations could not be modeled with Minuteman Software's GPSS/PC because of the substantial memory requirements of the model. Manufacturer suggestions that GPSS/PC will handle 2000 concurrently active transactions indicates that input stream compression on the order of 20 requisitions to each transaction will be necessary to keep memory requirements within the 640 kilobytes permitted by DOS.

B. RECOMMENDATIONS

1. Data Collection

The data collection efforts of NSD Yokosuka should be completed to permit model validation and experimentation using the present GPSS V program. The use of existing mean times to model requisition and issue document handling processes (i.e., remote terminal entry, document sorting) should not have an adverse impact on model performance due

to the brief and uniform nature of the tasks. However, the greater length and variability of service times in warehouse locations and the Packing Section do not permit accurate modeling with estimated mean times. The construction of frequency distributions from random samples of actual service times in the provisions storage locations, F-157 and the Packing Section will be necessary to complete model validation.

2. Model Experimentation

If data collection and model validation efforts can be completed under the coordination of NSD Yokosuka, the cooperation of an activity equipped with an IBM mainframe computer operating under the VM/CMS operating system will be necessary to permit experimentation with the model. Other activities in Japan, the Naval Postgraduate School and the Navy Fleet Material Support Office all offer support possibilities.

3. Microcomputer Implementation of the Model

Eventual implementation of a microcomputer version of the model would permit NSD Yokosuka Planning Division analysts to experiment with the model interactively. If validation of the present model is completed, it should be converted to GPSS/PC and the modifications necessary to compress the input stream should be made. Validation of the GPSS/PC version should then be completed in the same manner as the original model.

APPENDIX A

PROGRAM LISTING

TABLE OF CONTENTS

```
//YOKO JOB (4939,9999),'MIKE CLIFT',CLASS=G
//*MAIN LINES=(40)
// EXEC GPSSV,REGION.GO=2048K
//SYSIN DD *
       REALLOCATE XAC,20000
       REALLOCATE FAC,0
       REALLOCATE LOG,0
       REALLOCATE TAB,10
       REALLOCATE FSV,15
       REALLOCATE HSV,0
       REALLOCATE BSV,0
       REALLOCATE LSV,0
       REALLOCATE GRP,0
       REALLOCATE FMS,0
       REALLOCATE HMS,0
       REALLOCATE BMS,0
       REALLOCATE LMS,0
       REALLOCATE STO,100
       REALLOCATE QUE,100
       REALLOCATE COM,500000
************************************************************************
**                    PROGRAM EXECUTION CONTROL                       **
** THE SIMULATE STATEMENT MUST FOLLOW ALL JCL STATEMENTS AND GPSS     **
** REALLOCATE STATEMENTS. IT MARKS THE BEGINNING OF THE EXECUTABLE    **
** PROGRAM. THE PRECEDING REALLOCATE STATEMENTS ARE USED TO ALLOCATE**
** ADDRESSABLE MEMORY AMONG VARIOUS ENTITIES DEFINED IN THE PROGRAM.**
************************************************************************
*
       SIMULATE                          BEGIN SIMULATION
*
```

```
**********************************************************************
**                    INPUT PARAMETERS                              **
** INPUT PARAMETER VARIABLES ARE ASSIGNED VALUES FROM DATA PROVIDED **
** BY NSD. INPUT PARAMETER VARIABLES ARE USED TO CONTROL THE NUMBER **
** AND TYPE OF TRANSACTIONS GENERATED IN THE SIMULATION. THEY MAY   **
** BE CHANGED FOR THE PURPOSE OF EXPERIMENTATION.                   **
**********************************************************************
*
**DEMAND LEVEL INPUT PARAMETER*****************************************
*
**TOTAL DEMANDS PER MONTH**
 DMAND VARIABLE   43000
*
**INPUT PARAMETERS EXPRESSED IN NUMBER PER 1000 REQS REC'D************
*
**GROSS AVAILABILITY**
 GROSS VARIABLE   651
*
**REQUISITIONS RECEIVED VIA AUTODIN, DOSS OR LOCAL CUSTOMER RTE**
 ONLIN VARIABLE   447
*
**NO OF WEEKDAY DEMANDS REC'D DURING WORKDAY**
 DAYDD VARIABLE   891
*
**DEMAND EXCEPTIONS**
 DMDEX VARIABLE   63
*
**PERISHABLE PROVISIONS REQS - 9MP/9MB**
 PERPV VARIABLE   177
*
**DRY PROVISIONS REQS - 9MF**
 DRYPV VARIABLE   67
*
**SHIPS STORE STOCK REQS - 1Q**
 SSS   VARIABLE   13
*
****INPUT PARAMETERS EXPRESSED IN NUMBER PER 1000 ISSUES***************
*
**WAREHOUSE REFUSALS**
 WHREF VARIABLE   3
*
**INPUT PARAMETERS EXPRESSED IN AVERAGE WEIGHT IN LBS OF THREE ISSUES **
**FOR EACH WAREHOUSE AREA (TWO THOUSAND LBS PER MEASUREMENT TON)      **
*
**YOKOHAMA COLD STORAGE**
 YMCSW VARIABLE   1245
*
**YOKOSUKA COLD STORAGE (BLDG 1390)**
 YKCSW VARIABLE   1647
*
**DRY (B-47) WAREHOUSE**
 DRYWW VARIABLE   999
*
**A WAREHOUSE**
 AWHEW VARIABLE   1881
*
**B WAREHOUSE**
 BWHEW VARIABLE   2124
*
**MAIN (F-157) WAREHOUSE**
 MAINW VARIABLE   381
*
**F WAREHOUSE**
 FWHEW VARIABLE   2283
*
**J WAREHOUSE**
 JWHEW VARIABLE   3096
```

```
**INPUT PARAMETER - ENTER ISSUE BACKLOG THRESHOLD (LBS) *****************
**REQUIRED TO SCHEDULE AN ADDITIONAL TRACTOR TRAIN RUNS *****************
*
**ATRN ROUTE**
 AXTRA VARIABLE   64000
*
**BTRN ROUTE**
 BXTRA VARIABLE   64000
*
**PROVISIONS WAREHOUSE ROUTE**
 PXTRA VARIABLE   32000
*
**INPUT PARAMETER EXPRESSED IN NO. PER 1000 ISSUES RECEIVED IN PACKING***
*
**NO. ISSUES FOR LIGHT OR PARCEL POST PACK**
 LITEP VARIABLE   911
```

```
*************************************************************************
**                      VARIABLE COMPUTATION                           **
** SYMBOLIC NAME, COMPUTATION AND DEFINITION OF VARIABLES REFERENCED**
** DURING THE SIMULATION. VARIABLE VALUES ARE COMPUTED FROM INPUT   **
** PARAMETER VARIABLES, OTHER DEFINED VARIABLES OR FUNCTIONS.       **
*************************************************************************
*
**********COMPUTE DAY OF WEEK INDICATOR***********
**MON=1  TUES=2  WED=3  THU=4 FRI=5  SAT=6  SUN=0**
 DAY   VARIABLE   N$DAYC@7
*
**COMPUTE TIME OF DAY**
 TIME  VARIABLE   C1@2400
*
**NO OF WEEKDAY DEMANDS NOT REC'D  DURING WORKDAY PER 1000 REQS REC'D**
 NITDD VARIABLE   1000-V$DAYDD
*
**WEEKLY DEMANDS GIVEN MONTHLY DEMAND LEVEL**
 WDMND VARIABLE   (V$DMAND*231)/1000
*
**DAILY DEMANDS GIVEN MONTHLY DEMAND**
 DDMND VARIABLE   ((V$WDMND*FN$FTHNN)/1000)/3
*
**DEMANDS RECEIVED DURING THE WORKDAY**
 WRKDD VARIABLE   (V$DDMND*V$DAYDD)/1000
*
**DEMANDS RECEIVED DURING THE WORKDAY AM**
 AMDD  VARIABLE   (((V$DDMND*V$NITDD)/1000)*800)/1525
*
**DEMANDS RECEIVED DURING THE WORKDAY PM**
 PMDD  VARIABLE   (((V$DDMND*V$NITDD)/1000)*725)/1525
*
**NO REQS SENT TO REQUIREMENTS DIV. FOR STOCK CHECK PER 1000 REQS REC'D**
 RQCHK VARIABLE   V$PERPV+V$SSS
*
**NO REQS SENT TO REQUIREMENTS DIV. FOR STOCK**
**CHECK PER 1000 HARD COPY REQS REC'D        **
 RQDIV VARIABLE   1000*V$RQCHK/(1000-V$ONLIN)
*
**PROVISIONS REQS PER 1000 REQS REC'D**
 PROV  VARIABLE   V$PERPV+V$SSS+V$DRYPV
*
**NO OF DEMAND EXCEPTIONS PER MONTH**
 NUMEX VARIABLE   V$DMAND*V$DMDEX/1000
*
**NET DEMAND EXCEPTIONS PER 1000 ISSUES**
 NETEX VARIABLE   V$NUMEX*1000/((V$GROSS*V$DMAND)/1000)
*
**TRANSACTIONS NOT DEMAND EXCEPTION PER 1000 ISSUES**
 NOTEX VARIABLE   1000-V$NETEX
*
**ISSUES NOT WAREHOUSE REFUSALS PER 1000 ISSUE DOCS SENT TO WAREHOUSE**
 NOTWR VARIABLE   1000-V$WHREF
*
**SERVICE TIME VARIABLES (SUM OF 3 FUNCTION CALLS)*******************
*
 INEXP FVARIABLE  FN$FFORT+FN$FFORT+FN$FFORT+.5
```

```
**SERVICE TIME VARIABLES FOR GROUPS OF THREE - SERVICE TIME MEAN  ****
**MULTIPLIED BY V$INEXP FOR SERVICE TIME CONSTRUCTED FROM MEANS -  ****
**SUM OF THREE SERVICE TIME FUNCTION CALLS FOR SERVICE TIMES       ****
**CONSTRUCTED FROM CONTINUOUS DISTRIBUTIONS                        ****

 SKCKS VARIABLE   FN$FELEV*V$INEXP
*
 RTES  VARIABLE   FN$FTWEL*V$INEXP
*
 DEEXS VARIABLE   FN$FTHTN*V$INEXP
*
 SCSOS VARIABLE   FN$FSXTN*V$INEXP
*
 YMCSS VARIABLE   FN$FEITN*V$INEXP
*
 YKCSS VARIABLE   FN$FNNTN*V$INEXP
*
 DRYWS VARIABLE   FN$FTWEN*V$INEXP
*
 AWHES VARIABLE   FN$FTWON+FN$FTWON+FN$FTWON
*
 BWHES VARIABLE   FN$FTWTW+FN$FTWTW+FN$FTWTW
*
 MAINS VARIABLE   FN$FTWTH*V$INEXP
*
 FWHES VARIABLE   FN$FTWFR+FN$FTWFR+FN$FTWFR
*
 JWHES VARIABLE   FN$FTWFV+FN$FTWFV+FN$FTWFV
*
 HVYPS VARIABLE   FN$FTWSX*V$INEXP
*
 LITPS VARIABLE   FN$FTWSV*V$INEXP
*
**ESTIMATED WEIGHT OF TRANSACTIONS AWAITING THE TRACTOR TRAINS********
*
**ATRN ROUTE**
 AWGHT VARIABLE   (CH$MAINC*V$MAINW)+(CH$FCH*V$FWHEW)
*
**BTRN ROUTE**
 BWGHT VARIABLE   (CH$ACH*V$AWHEW)+(CH$BCH*V$BWHEW)+(CH$JCH*V$JWHEW)
*
**PROVISIONS WAREHOUSE ROUTE**
 PWGHT VARIABLE   CH$PTRNC*((V$YKCSW+V$DRYWW)/2)
*
**VARIABLE COUNTS GROUPS OF 3 LEAVING DUTY SECTION MODULE************
 COUNT VARIABLE   N$DUTTR@3
```

```
*************************************************************************
**              BOOLEAN VARIABLE COMPUTATION                           **
** SYMBOLIC NAME, COMPUTATION AND DEFINITION OF BOOLEAN VARIABLES      **
** REFERENCED IN THE SIMULATION. BOOLEAN VARIABLES ARE USED IN THE     **
** SIMULATION TO CONTROL OPERATIONS SCHEDULING.                        **
*************************************************************************
*
**WORKDAY INDICATOR, TRUE (1) IF MONDAY THROUGH FRIDAY**
 WKDAY BVARIABLE  V$DAY'GE'K1*V$DAY'LE'K5
*
**LUNCHTIME INDICATOR, TRUE IF 1201 - 1245 ON WORKDAY
 LUNCH BVARIABLE  V$TIME'GE'K1201*V$TIME'LE'K1275*BV$WKDAY'E'K1
*
**NIGHTTIME INDICATOR, TRUE IF BEFORE 0801 OR AFTER 1645 ON WORKDAY
 NIGHT BVARIABLE  (V$TIME'GE'K1676+V$TIME'LE'K800)*BV$WKDAY'E'K1
*
**WORKING HOURS INDICATOR, TRUE IF 0801 - 1200 OR 1246 - 1645 ON WORKDAY
 WORKH BVARIABLE  BV$LUNCH'E'K0*BV$NIGHT'E'K0*BV$WKDAY'E'K1
*
**DEPOT OPEN INDICATOR, TRUE IF 0801 - 1645 ON WORKDAY
 OPEN  BVARIABLE  BV$LUNCH'E'K1+BV$WORKH'E'K1
*
 PTIME BVARIABLE  V$TIME'E'800+V$TIME'E'1000+V$TIME'E'1275+V$TIME'E'1475
*                                    SET TO TRUE AT IPG2 PRINT TIMES
*
 PRTWO BVARIABLE  BV$WKDAY'E'K1*BV$PTIME'E'K1
*                                    SET TO TRUE ON WORKDAYS TO PRINT
*                                    IPG2 BATCH
*
 PRTHR BVARIABLE  BV$WKDAY'E'1*V$TIME'E'800
*                                    SET TO TRUE ON WORKDAYS TO PRINT
*                                    IPG3 BATCH
*
 BTIME BVARIABLE  V$TIME'E'900+V$TIME'E'1100+V$TIME'E'1375+V$TIME'E'1525
*                                    SET TO TRUE AT ISSUE DOC DELIVERY
*                                    TIMES
*
 DTIME BVARIABLE  BV$WKDAY'E'K1*BV$BTIME'E'K1
*                                    SET TO TRUE AT DELIVERY TIME ON
*                                    WORKDAYS
*
**BOOLEAN VARIABLE SET TO TRUE IF ISSUE FOR BEARER PICK-UP**
 BEAR  BVARIABLE  P1'E'K7+P1'E'K5+P1'E'K3
*
**BOOLEAN VARIABLE SET TO TRUE ON EVERY THIRD TRANSACTION LEAVING DUTY**
 THREE BVARIABLE  V$COUNT'E'0
```

```
**********************************************************************
**              TRANSACTION PRIORITIES AND PARAMETERS                **
** KEY TO PRIORITIES AND PARAMETERS ASSIGNED AND REFERENCED DURING    **
** THE SIMULATION.                                                    **
********************************************************** ********
*
*PRIORITY     REQ PRIORITY                MATCHES P1
*
*P1           REQ PRIORITY                IPG1 BWT            = 7
*                                         IPG1 (ALL OTHER)    = 6
*                                         IPG2 BWT            = 5
*                                         IPG2 CASREPT
*                                         (NOT BWT)           = 4
*                                         IPG2 QUICK PICK     = 3
*                                         IPG2 (ALL OTHER)    = 2
*                                         IPG3                = 1
*
*P2           STORAGE AREAS               YOKOHAMA COLD STORAGE  = 1
*                                         YOKOSUKA COLD STORAGE  = 2
*                                         (BUILDING 1390)
*                                         DRY PROVISIONS         = 3
*                                         (B-47)
*                                         A AREA WAREHOUSES      = 4
*                                         (A-19)
*                                         B AREA WAREHOUSES      = 5
*                                         (B-33,B-45,B-46)
*                                         MAIN WAREHOUSE         = 6
*                                         (F-157)
*                                         F AREA WAREHOUSES      = 7
*                                         (F-8,F-9,F-10,F-11,
*                                         F-12,F-13,F-14)
*                                         J AREA WAREHOUSES     = 8
*                                         (J-11,J-12 AND GAS,
*                                         LUMBER AND DRUM YARDS)
*
*
*P3           TRANSACTION POINT OF        PARAMETER VALUES EVALUATED
*            PROGRESS PARAMETER          BY FUNCTIONS FTHIR AND FTHON
*            (SPECIFIES DUTY SECTION
*            PROCESSING REQUIRED AND/
*            OR POINT OF RETURN FOR
*            TRANSACTIONS NOT
*            PROCESSED BY THE DUTY
*            SECTION)
*
*P4           NSD TRANSPORTATION          MAJOR CUSTOMER (PWC,SRF)  = 1
*            DESTINATIONS                NOTE: NOT ASSIGNED IN
*                                        PROVISIONS STORAGE LOCATIONS
*                                        PACKING DIVISION          = 2
*                                        FREIGHT TERMINAL DIVISION = 3
*
*P5           ISSUE WEIGHT                WEIGHT ASSIGNED TO TRANSACTIONS
*                                         EXPRESSED IN LBS
*
*P6           STOCK STATUS                NIS/NC   = 1
*                                         IN STOCK = 2
*
*P7           DEMAND EXCEPTION STATUS     PROCESSED DEMAND EXCEPTION = 1
*
*P8           WAREHOUSE REFUSAL STATUS    WAREHOUSE REFUSAL = 1
```

```
*****************************************************************
**                    STORAGE DEFINITIONS                      **
** SYMBOLIC ADDRESS, CAPACITY AND BRIEF EXPLANATION OF NSD     **
** FUNCTIONAL AREAS MODELED AS STORAGES WITHIN THE SIMULATION. **
** CAPACITIES REFLECT NUMBER OF PERSONNEL WORKING IN THE MODELED **
** WORKCENTER EXCEPT FOR THE ATRN AND BTRN STORAGES WHICH REFLECT **
** TRACTOR TRAIN CAPACITY IN POUNDS.                           **
*****************************************************************
*
        STORAGE     S$SKCK,6            NO OF CLERKS IN REQUIREMENTS
*                                       PERFORMING STOCK CHECKS
*
        STORAGE     S$CRTE,5            NO OF RTE OPERATORS IN CUST SERV
*                                       ENTERING REQS
*
        STORAGE     S$DRTE,2            NO OF RTE OPERATORS IN DPSC
*                                       ENTERING REQS
*
        STORAGE     S$DEEX,2            NO OF CLERKS IN CUST SERV
*                                       PROCESSING DEMAND EXCEPTIONS
*
        STORAGE     S$SCPR,100000       STORAGE CONTROL PRINTER, UNLIMITED
*                                       CAPACITY
*
        STORAGE     S$CSPR,100000       CUST SERV PRINTER, UNLIMITED
*                                       CAPACITY
*
        STORAGE     S$SCNT,4            NO OF STORAGE CONTROL PERSONNEL
*                                       MARKING,BURSTING AND SORTING
*                                       ISSUE DOCUMENTS
*
        STORAGE     S$STOF,1            NO OF STORAGE OFFICE PERSONNEL
*                                       MARKING,BURSTING AND SEGREGATING
*                                       ISSUE DOCUMENTS
*
        STORAGE     S$DLVR,100000       ISSUE DOC DELIVERY TO YOKOHAMA
*                                       COLD STORAGE, UNLIMITED CAPACITY
*
        STORAGE     S$YMCS,11           NO. OF WAREHOUSE PERSONNEL AT
*                                       YOKOHAMA COLD STORAGE IN ISSUE AND
*                                       SHIPMENT PREP OPERATIONS
*
        STORAGE     S$YKCS,4            NO. OF WAREHOUSE PERSONNEL AT
*                                       BUILDING 1390 (YOKSUKA COLD STOR.)
*                                       IN ISSUE AND SHIPMENT PREP
*                                       OPERATIONS
*
        STORAGE     S$DRYW,2            NO. OF WAREHOUSE PERSONNEL AT
*                                       YOKOSUKA DRY STORAGE (B-47) IN
*                                       ISSUE AND SHIPMENT PREP OPERATIONS
*
        STORAGE     S$AWHE,2            NO. OF WAREHOUSE PERSONNEL AT
*                                       A AREA WAREHOUSES IN ISSUE OPS
*
        STORAGE     S$BWHE,2            NO. OF WAREHOUSE PERSONNEL AT
*                                       B AREA WAREHOUSES IN ISSUE OPS
*
        STORAGE     S$MAIN,8            NO. OF WAREHOUSE PERSONNEL AT
*                                       F-157 IN ISSUE OPS
*
        STORAGE     S$FWHE,1            NO. OF WAREHOUSE PERSONNEL AT
*                                       F AREA WAREHOUSES IN ISSUE OPS
*
        STORAGE     S$JWHE,4            NO. OF WAREHOUSE PERSONNEL AT
*                                       J AREA WAREHOUSES IN ISSUE OPS
```

```
*
*
*
*
*
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*
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*
*
*
*
*
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*
```

STORAGE	S$ATRN,32000	CAPACITY, EXPRESSED IN POUNDS, OF THE ON-BASE TRACTOR TRAIN (A-ROUTE)
STORAGE	S$BTRN,32000	CAPACITY, EXPRESSED IN POUNDS OF THE ON-BASE TRACTOR TRAIN (B-ROUTE)
STORAGE	S$PTRN,32000	PROVISIONS TRACTOR TRAIN, CAPACITY NOT REFERENCED DURING SIMULATION
STORAGE	S$LITP,5	NO OF PACKERS IN LIGHT PACK LINE
STORAGE	S$HVYP,3	NO OF HEAVY PACK CREWS
STORAGE	S$DUTY,2	TWO MAN DUTY SECTION
STORAGE	S$BIKE,100000	BICYCLE MESSENGER DELIVERING ISSUE DOCUMENTS TO YOKOSUKA STORAGE LOCATIONS

```
*************************************************************************
**                          FUNCTIONS                                  **
** DEFINITION OF FUNCTIONS USED IN THE SIMULATION PROGRAM. FUNCTIONS**
** ARE PARTIONED BY TYPE.                                             **
*************************************************************************
*
**PARAMETER ASSIGNMENT FUNCTIONS*************************************
*
 FONE  FUNCTION   RN1,D7                REQ PRIORITY
0.66696,1/.96695,2/.96978,3/.96995,4/.98713,5/.99983,6/1.0,7
*
 FTWO  FUNCTION   RN1,D8                WAREHOUSE LOCATION ASSIGNMENT
0.17127,1/.22920,2/.30846,3/.35334,4
0.40118,5/.90023,6/.94454,7/1.0,8
*
*                                       ASSIGNS FUNCTION TO PROVIDE ISSUE
 FTHRE FUNCTION   P2,E8                 DESTINATION IN DUTY SECTION MODULE
1,FN$FFOUR/2,FN$FFOUR/3,FN$FFIVE/4,FN$FSIX/5,FN$FSEVE
6,FN$FEIGH/7,FN$FNINE/8,FN$FTEN
*
 FFOUR FUNCTION   RN1,D2                BLDG 1390 ISSUE DEST. ASSIGN.
0.9326,1/1.0,2
*
 FFIVE FUNCTION   RN1,D2                B-47 ISSUE DESTINATION ASSIGNMENT
0.6264,1/1.0,2
*
 FSIX  FUNCTION   RN1,D3                A AREA ISSUE DESTINATION ASSIGN.
0.0389,1/.6897,2/1.0,3
*
 FSEVE FUNCTION   RN1,D3                B AREA ISSUE DESTINATION ASSIGN.
0.2888,1/.7744,2/1.0,3
*
 FEIGH FUNCTION   RN1,D3                F-157 ISSUE DESTINATION ASSIGN.
0.0167,1/.6772,2/1.0,3
*
 FNINE FUNCTION   RN1,D3                F AREA ISSUE DESTINATION ASSIGN.
0.3662,1/.8054,2/1.0,3
*
 FTEN  FUNCTION   RN1,D3                J AREA ISSUE DESTINATION ASSIGN.
0.1357,2/.7312,2/1.0,3
*
**SERVICE TIME ASSIGNMENT FUNCTIONS**********************************
*
 FELEV FUNCTION   RN1,D2                STOCK CHECK SERVICE TIME
0.0,0/1.0,1
*
 FTWEL FUNCTION   RN1,D2                REMOTE TERMINAL ENTRY SERVICE TIME
0.0,0/1.0,1
*
*                                       FUNCTION ASSIGNMENT FOR DEMAND
 FTHTN FUNCTION   P8,E2                 EXCEPTION PROCESSING
0,FN$FFRTN/1,FN$FFFTN
*
 FFRTN FUNCTION   RN1,D2                DEMAND EXCEP. PROCESSING TIME
0.0,0/1.0,1
*
 FFFTN FUNCTION   RN1,D2                WAREHOUSE REF. PROCESSING TIME
0.0,0/1.0,5
*
*                                       STORAGE CONTROL/STORAGE OFFICE
 FSXTN FUNCTION   RN1,D2                ISSUE DOC HANDLING TIME
0.0,0/1.0,1
```

```
*                                       ASSIGNS FUNCTION TO PROVIDE
 FSVTN FUNCTION   P2,E8                 WAREHOUSE SERVICE TIME
1,FN$FEITN/2,FN$FNNTN/3,FN$FTWEN/4,FN$FTWON
5,FN$FTWIW/6,FN$FTWTH/7,FN$FTWFR/8,FN$FTWFV
*
 FEITN FUNCTION   RN1,D2                YOKOHAMA C/S PICK TIME
0.0,0/1.0,17
*
 FNNTN FUNCTION   RN1,D2                YOKOSUKA C/S (BLDG 1390) PICK TIME
0.0,0/1.0,17
*
 FTWEN FUNCTION   RN1,D2                B-47 PICK TIME
0.0,0/1.0,7
*
 FTWON FUNCTION   RN1,C24               A-19 PICK TIME
0.038,3/.115,5/.192,7/.269,8/.308,10/.333,12
0.359,13/.423,15/.474,17/.551,18/.628,20
0.654,22/.692,23/.744,25/.756,27/.769,28/.859,30
0.872,32/.936,33/.949,40/.962,43/.974,47/.987,50/1.0,57
*
 FTWTW FUNCTION   RN1,C6                B WAREHOUSE PICK TIME
0.045,7/.545,8/.682,10/.818,13/.955,17/1.0,25
*
 FTWTH FUNCTION   RN1,D2                F-157 PICK TIME
0.0,0/1.0,8
*
 FTWFR FUNCTION   RN1,C9                F WAREHOUSE PICK TIME
0.153,1/.292,2/.319,3/.472,5
0.514,7/.681,8/.917,10/.958,12/1.0,17
*
 FTWFV FUNCTION   RN1,C23               J WAREHOUSE PICK TIME
0.008,3/.085,5/.185,7/.385,8/.462,10/.547,12
0.585,13/.600,15/.677,17/.692,18/.708,20/.754,25
0.770,27/.854,33/.885,37/.892,40/.915,42/.931,45
0.946,47/.969,50/.985,53/.992,200/1.0,267
*
 FTWSX FUNCTION   RN1,D2                HEAVY PACK SERVICE TIME
0.0,0/1.0,42
*
*                                       FUNCTION ASSIGNMENT FOR LIGHT/
 FTWSV FUNCTION   RN1,E2                PARCEL POST PROCESSING TIME
0.939,FN$FTWEI/1.0,FN$FTWNN
*
 FTWEI FUNCTION   RN1,D2                LIGHT PACK SERVICE TIME
0.0,0/1.0,7
*
 FTWNN FUNCTION   RN1,D2                PARCEL POST PACK SERVICE TIME
0.0,0/1.0,8
*
**TRANSACTION TRANSFER LOCATION ASSIGNMENT*****************************
*
*                                       TRANSFER LOCATION FOR TRANSACTIONS
*                                       NOT HANDLED BY THE DUTY SECTION
 FTHIR FUNCTION   P3,D26                OR NOT RESULTING IN AN ISSUE
0,SKCKQ/1,CRTEQ/2,DTNIS/3,DEEXQ/4,SCNTQ/5,STOFQ/6,DLVRQ/7,BIKEQ
8,YMCSQ/9,YKCSQ/10,DRYWQ/11,AWHEQ/12,BWHEQ/13,MAINQ/14,FWHEQ/15,JWHEQ
16,PQUE/17,AQUE/18,BQUE/19,MQUE/20,FQUE/21,JQUE/22,HVYPQ/23,LITPQ
24,ALLCT/25,DTWR
```

```
*                                       TRANSFER LOCATION WITHIN DUTY
 FTHON FUNCTION   P3,D23                SECTION BASED ON P3
0,PZERO/1,PONE/3,PTHRE/4,PFOUR/5,PFOUR/6,PSIX/7,PSIX/8,PEIGH
9,PEIGH/10,PEIGH/11,PEIGH/12,PEIGH/13,PEIGH/14,PEIGH/15,PEIGH/16,PSXTN
17,PSXTN/18,PSXTN/19,PSXTN/20,PSXTN/21,PSXTN/22,PTWTW/23,PTWTH
*
 FTHTW FUNCTION   P2,D8                 WAREHOUSE LOCATION TRANSFER
1,YMCSQ/2,YKCSQ/3,DRYWQ/4,AWHEQ/5,BWHEQ/6,MAINQ/7,FWHEQ/8,JWHEQ
*
*                                       CONTROL TRANSACTION DESTINATION
 FTHTH FUNCTION   P1,D8                 IN SIMULATION TIME CONTROL MODULE
1,SONE/2,STWO/3,STHRE/4,SFOUR/5,SFIVE/6,SSIX
7,SSEVE/8,SEIGH
*
*                                       TRANSFER LOCATION FOR TRACTOR
 FTHFR FUNCTION   P2,D2                 TRAIN OVERFLOW (A ROUTE)
6,MLINK/7,FLINK
*
*                                       TRANSFER LOCATION FOR TRACTOR
 FTHFV FUNCTION   P2,D3                 TRAIN OVERFLOW (B ROUTE)
4,ALINK/5,BLINK/8,JLINK
*
**TRANSPORTATION TIME ASSIGNMENT FUNCTIONS*****************************
*
*                                       BICYCLE MESSENGER ROUTE TIME
 FTHSX FUNCTION   P2,D7                 ASSIGN. FOR ISSUE DOC DELIVERY
2,73/3,18/4,50/5,28/6,7/7,7/8,75
*
*                                       CUSTOMER SERVICE TO WAREHOUSE
 FTHSV FUNCTION   P2,D8                 TRANSPORTATION TIMES
1,150/2,10/3,3/4,15/5,5/6,2/7,3/8,13
*                                       WAREHOUSE LOCATION TO BLDG J-39
 FTHEI FUNCTION   P2,D7                 TRANSPORTATION TIMES
2,12/3,7/4,13/5,3/6,5/7,8/8,7
*
**DAILY DEMAND LEVEL ASSIGNMENT FUNCTIONS*****************************
*
*                                       AVERAGE % OF WEEKLY DEMANDS
 FTHNN FUNCTION   V$DAY,D7              EXPERIENCED ON EACH DAY
0,21/1,168/2,150/3,200/4,201/5,205/6,55
*
**STANDARD DISTRIBUTION FUNCTIONS**************************************
*
 FFORT FUNCTION   RN1,C24               INVERSE EXPONENTIAL FUNCTION
0.0,0/.1,.104/.2,.222/.3,.355/.4,.509/.5,.69
0.6,.915/.7,1.2/.75,1.38/.8,1.6/.84,1.83/.88,2.12
0.9,2.3/.92,2.52/.94,2.81/.95,2.99/.96,3.2/.97,3.5
0.98,3.9/.99,4.6/.995,5.3/.998,6.2/.999,7/.9998,8
```

```
*************************************************************************
**                  MASTER SCHEDULE CONTROL                            **
** SIMULATE ONE WEEK OF OPERATIONS IN INCREMENTS OF .01 HOURS. A       **
** CONTROL TRANSACTION IS GENERATED AT THE BEGINNING OF EACH DAY.      **
** ADVANCE BLOCKS ARE USED TO MOVE THE TRANSACTION THROUGH A           **
** WORKDAY SCHEDULE. AT APPROPRIATE TIMES, STORAGES REPRESENTING       **
** DEPOT WORKCENTERS ARE OPENED AND CLOSED AND TRANSACTIONS ARE        **
** LINKED TO AND UNLINKED FROM USER CHAINS BY SENDING THE CONTROL      **
** TRANSACTION TO THE STORAGE CONTROL AND USER CHAIN CONTROL           **
** MODULES.                                                           **
*************************************************************************
*
       GENERATE   16800                GENERATE SIMULATION CONTROL
*                                      TRANSACTION
       TERMINATE  1                    TERMINATE SIMULATION
*
**GENERATE A CONTROL TRANSACTION AT THE BEGINNING OF EACH DAY*********
*
 DAYC  GENERATE   2400,0,1             GENERATE CONTROL TRANSACTION
*
       TEST E     BV$WKDAY,K1,SEIGH    SEND TO SEIGH IF SAT/SUN ELSE NEXT
*                                      BLOCK
       ASSIGN     1,K1                 TAG FOR RETURN
       TRANSFER   ,UNAVL               SEND TO UNAVL
*
 SONE  ADVANCE    800                  ADVANCE TO 0801
       ASSIGN     1,K2                 TAG FOR RETURN
       TRANSFER   ,AVAIL               SEND TO AVAIL
 STWO  ASSIGN     1,K3                 TAG FOR RETURN
       TRANSFER   ,START               SEND TO START
*
 STHRE ADVANCE    400                  ADVANCE TO 1201
       ASSIGN     1,K4                 TAG FOR RETURN
       TRANSFER   ,UNAVL               SEND TO UNAVL
*
 SFOUR ADVANCE    75                   ADVANCE TO 1246
       ASSIGN     1,K5                 TAG FOR RETURN
       TRANSFER   ,AVAIL               SEND TO AVAIL
 SFIVE ASSIGN     1,K6                 TAG FOR RETURN
       TRANSFER   ,START               SEND TO START
*
 SSIX  ADVANCE    400                  ADVANCE TO 1646
       ASSIGN     1,K7                 TAG FOR RETURN
       TRANSFER   ,UNAVL               SEND TO UNAVL
 SSEVE ASSIGN     1,K8                 TAG FOR RETURN
       TRANSFER   ,FNISH               SEND TO FNISH
 SEIGH TERMINATE                       TERMINATE CONTROL TRANSACTION
```

```
*************************************************************************
**                      STORAGE CONTROL                                **
** AVAILABILITY OF STORAGES IS CONTROLLED BY THE MASTER SCHEDULE       **
** CONTROL MODULE. SUNAVAIL CLOSES STORAGES, SAVAIL OPENS THEM         **
** TO COINCIDE WITH NSD NORMAL WORKDAY SCHEDULE. PROCESSING OF         **
** TRANSACTIONS IN STORAGES WHEN THEY ARE MADE UNAVAILABLE  IS         **
** COMPLETED.                                                          **
*************************************************************************
*
 UNAVL SUNAVAIL   SKCK
       SUNAVAIL   CRTE
       SUNAVAIL   DRTE
       SUNAVAIL   DEEX
       SUNAVAIL   SCNT
       SUNAVAIL   STOF
       SUNAVAIL   YMCS
       SUNAVAIL   YKCS
       SUNAVAIL   DRYW
       SUNAVAIL   AWHE
       SUNAVAIL   BWHE
       SUNAVAIL   MAIN
       SUNAVAIL   FWHE
       SUNAVAIL   JWHE
       SUNAVAIL   LITP
       SUNAVAIL   HVYP
       TRANSFER   FN,FTHTH             RETURN TO SIMULATION TIME CONTROL
*
 AVAIL SAVAIL     SKCK
       SAVAIL     CRTE
       SAVAIL     DRTE
       SAVAIL     DEEX
       SAVAIL     SCNT
       SAVAIL     STOF
       SAVAIL     YMCS
       SAVAIL     YKCS
       SAVAIL     DRYW
       SAVAIL     AWHE
       SAVAIL     BWHE
       SAVAIL     MAIN
       SAVAIL     FWHE
       SAVAIL     JWHE
       SAVAIL     LITP
       SAVAIL     HVYP
       TRANSFER   FN,FTHTH             RETURN TO SIMULATION TIME CONTROL
```

```
*************************************************************************
**                    USER CHAIN CONTROL                               **
** TRANSACTIONS ARE PLACED ON USER CHAINS TO SAVE EXECUTION TIME       **
** AND TO MAINTAIN CONTROL OF TRANSACTIONS THAT MUST BE WORKED BY      **
** THE DUTY SECTION. THE "FNISH" SEGMENT REMOVES ALL TRANSACTIONS      **
** FROM LISTED USER CHAINS AT THE END OF THE WORKDAY AND, WITHIN       **
** THEIR RESPECTIVE MODULES, HIGH PRIORITY REQUISITIONS ARE SENT TO    **
** THE DUTY SECTION MODULE FOR PROCESSING. THE "START" SEGMENT         **
** RELEASES ENOUGH TRANSACTIONS TO FILL THE RESPECTIVE STORAGES        **
** EACH WORKDAY MORNING AND IMMEDIATELY AFTER LUNCH.                   **
*************************************************************************
*
 FNISH UNLINK     SKCKC,SKCKT,ALL,BACK
       UNLINK     CRTEC,CRTET,ALL,BACK
       UNLINK     DEEXC,DEEXT,ALL,BACK
       UNLINK     SCNTC,SCNTT,ALL,BACK
       UNLINK     STOFC,STOFT,ALL,BACK
       UNLINK     YMCSC,YMCST,ALL,BACK
       UNLINK     YKCSC,YKCST,ALL,BACK
       UNLINK     DRYWC,DRYWT,ALL,BACK
       UNLINK     AWHEC,AWHET,ALL,BACK
       UNLINK     BWHEC,BWHET,ALL,BACK
       UNLINK     MAINC,MAINT,ALL,BACK
       UNLINK     FWHEC,FWHET,ALL,BACK
       UNLINK     JWHEC,JWHET,ALL,BACK
       UNLINK     HVYPC,HVYPT,ALL,BACK
       UNLINK     LITPC,LITPT,ALL,BACK
       TRANSFER   FN,FTHTH              RETURN TO SIMULATION TIME CONTROL
*
 START UNLINK     SKCKC,SKCKE,6,BACK
       UNLINK     CRTEC,CRTEE,5,BACK
       UNLINK     DRTEC,DRTEE,2,BACK
       UNLINK     DEEXC,DEEXE,2,BACK
       UNLINK     SCNTC,SCNTE,4,BACK
       UNLINK     STOFC,STOFE,1,BACK
       UNLINK     YMCSC,YMCSE,11,BACK
       UNLINK     YKCSC,YKCSE,4,BACK
       UNLINK     DRYWC,DRYWE,2,BACK
       UNLINK     AWHEC,AWHEE,2,BACK
       UNLINK     BWHEC,BWHEE,2,BACK
       UNLINK     MAINC,MAINE,8,BACK
       UNLINK     FWHEC,FWHEE,1,BACK
       UNLINK     JWHEC,JWHEE,4,BACK
       UNLINK     HVYPC,HVYPE,3,BACK
       UNLINK     LITPC,LITPE,5,BACK
       TRANSFER   FN,FTHTH              RETURN TO SIMULATION TIME CONTROL
```

```
*************************************************************************
**                    REQUISITION GENERATION                           **
** IN THIS MODULE, SPLIT BLOCKS REFERENCE VARIABLES DEFINED IN         **
** TERMS OF INPUT PARAMETERS SET BY THE USER TO GENERATE               **
** TRANSACTIONS AT THE DEMAND LEVEL SPECIFIED BY THE USER.             **
** TRANSACTIONS ARE ADVANCED INTO THE MODEL AT A UNIFORM RATE,         **
** THOUGH THE RATES ARE ADJUSTED TO MATCH REAL SYSTEM ARRIVAL          **
** CHARACTERISTICS. FOLLOWING GENERATION, REQUISITIONS ARE ASSIGNED    **
** A PRIORITY MATCHING THE PARAMETER 1 ASSIGNMENT. SAVEVALUES THEN     **
** RECORD THE TOTAL NUMBER OF REQS GENERATED AND THE NUMBER            **
** IN EACH PRIORITY GROUP.                                             **
*************************************************************************
**                         NOTE:                                       **
** ENTITIES FLOWING THROUGH GPSS PROGRAMS ARE KNOWN AS TRANSACTIONS.   **
** THE TERM "TRANSACTION" WILL BE USED IN THIS PROGRAM AS A GENERIC    **
** TERM FOR REQUISITIONS IN ANY STAGE OF PROCESSING. IN MODULE         **
** DESCRIPTIONS AND COMMENTS, TRANSACTIONS MAY BE CALLED REQS          **
** (REQUISITIONS), ISSUE DOCS (ISSUE DOCUMENTS) OR ISSUES (AFTER       **
** WAREHOUSE PICK) AS APPROPRIATE TO THE MODULE TO CLARIFY THE         **
** PROCESS BEING MODELED. TRANSACTIONS USED IN SCHEDULE CONTROL        **
** SECTIONS WILL ALWAYS BE REFERRED TO AS CONTROL TRANSACTIONS.        **
*************************************************************************
**                         NOTE:                                       **
** GPSS QUEUE AND DEPART BLOCKS ARE PAIRED BEFORE MOST STORAGES TO     **
** GATHER QUEUE STATISTICS PROVIDED IN THE OUTPUT. SO THAT QUEUE       **
** STATISTICS REFLECT ACTUAL DEMAND LEVELS SIMULATED, ALL              **
** TRANSACTIONS JOINING AND DEPARTING QUEUES ARE COUNTED AS THREE.     **
** TRANSACTIONS ARE SPLIT AND INDIVIDUALLY QUEUED IN THE DUTY          **
** SECTION MODULE. STORAGES ARE BRACKETED BY ENTER AND LEAVE           **
** STATEMENTS TO LIMIT TRANSACTION ACCESS TO THE DEFINED CAPACITY      **
** OF THE STORAGE. BECAUSE THE PURPOSES OF THESE BLOCKS ARE STANDARD   **
** THROUGHOUT THE PROGRAM, THEY WILL NOT GENERALLY BE COMMENTED.       **
*************************************************************************
*
**AM REQUISITION GENERATION (WEEKDAY)**********************************
        GENERATE    2400,,1,,,8PH          GENERATE A SINGLE TRANSACTION AT
*                                           0001 EACH DAY
        TEST E      BV$WKDAY,K1,RQTRM      TRANSFER TO NEXT BLOCK IF ON A
*                                           WORKDAY, ELSE TO RQTRM
        SPLIT       V$AMDD,AMAD            SPLIT TRANSACTION INTO THE NUMBER
*                                           OF REQS REC'D DURING WORKDAY AM
 AMAD   ADVANCE     400,400                SPREAD REQUISITION FLOW UNIFORMLY
*                                           THROUGHOUT WORKDAY AM
        TRANSFER    ,PRIAS                 TRANSFER ALL TO PRIAS
*
**WORKING HOURS REQUISITION GENERATION (WEEKDAY)**********************
        GENERATE    2400,,801,,,8PH        GENERATE A SINGLE TRANSACTION AT
*                                           0801 EACH DAY
        TEST E      BV$WKDAY,K1,RQTRM      TRANSFER TO NEXT BLOCK IF A
*                                           WORKDAY, ELSE TO RQTRM
        SPLIT       V$WRKDD,DAYAD          SPLIT TRANSACTION INTO THE NUMBER
*                                           OF REQS REC'D DURING WORKDAY
 DAYAD  ADVANCE     437,437                SPREAD REQUISITION FLOW UNIFORMLY
*                                           THROUGHOUT WORKDAY
        TRANSFER    ,PRIAS                 TRANSFER ALL TO PRIAS
*
**PM REQUISITION GENERATION (WEEKDAY)**********************************
        GENERATE    2400,,1676,,,8PH       GENERATE A SINGLE TRANSACTION AT
*                                           1646 EACH DAY
        TEST E      BV$WKDAY,K1,RQTRM      TRANSFER TO NEXT BLOCK IF ON A
*                                           WORKDAY, ELSE TO RQTRM
        SPLIT       V$PMDD,PMAD            SPLIT TRANSACTION INTO THE NUMBER
*                                           OF REQS REC'D DURING WORKDAY PM
 PMAD   ADVANCE     362,362                SPREAD REQUISITION FLOW UNIFORMLY
*                                           THROUGHOUT WORKDAY PM
        TRANSFER    ,PRIAS                 TRANSFER ALL TO PRIAS
```

```
**WEEKEND REQUISITION GENERATION*******************************
       GENERATE   2400,,1,,,8PH          GENERATE A SINGLE TRANSACTION AT
*                                        0001 EACH DAY
       TEST E     BV$WKDAY,K0,RQTRM      TRANSFER TO NEXT BLOCK IF ON A
*                                        WEEKEND, ELSE TO RQTRM
       SPLIT      V$DDMND,WKDAD          SPLIT TRANSACTION INTO THE NUMBER
*                                        OF REQS REC'D DURING WEEKEND DAY
 WKDAD ADVANCE    1200,1200              SPREAD REQUISITION FLOW UNIFORMLY
*                                        THROUGHOUT WORKDAY PM
       TRANSFER   ,PRIAS                 TRANSFER ALL TO PRIAS
*
 RQTRM TERMINATE                         TERMINATE DISCARDED TRANSACTIONS
**PRIORITY ASSIGNMENT AND STATISTICS SECTION**********************
*
 PRIAS ASSIGN     1,FN$FONE              ASSIGNMENT OF REQ PRIORITY TO P1
       PRIORITY   P1                     ASSIGNMENT OF ACTUAL TRANSACTION
*                                        PRIORITY (MATCHES P1 ASSIGN.)
       SAVEVALUE  REQCT+,1,XF            COUNTS TOTAL NO OF REQS GENERATED
       SAVEVALUE  REQCT+,1,XF            COUNTS TOTAL NO OF REQS GENERATED
       SAVEVALUE  REQCT+,1,XF            COUNTS TOTAL NO OF REQS GENERATED
       TEST NE    P1,1,CNTTH             SEND IPG3 REQS TO CNTTH, ALL
*                                        OTHERS TO NEXT BLOCK
       TEST G     P1,5,CNTTW             SEND IPG2 REQS TO CNTTW, ALL
*                                        OTHERS TO NEXT BLOCK
       SAVEVALUE  PRION+,1,XF            COUNT IPG1 REQS
       SAVEVALUE  PRION+,1,XF            COUNT IPG1 REQS
       SAVEVALUE  PRION+,1,XF            COUNT IPG1 REQS
       TRANSFER   ,RECPT                 TRANSFER ALL TO RECPT
*
 CNTTW SAVEVALUE  PRITW+,1,XF            COUNT IPG2 REQS
       SAVEVALUE  PRITW+,1,XF            COUNT IPG2 REQS
       SAVEVALUE  PRITW+,1,XF            COUNT IPG2 REQS
       TRANSFER   ,RECPT                 TRANSFER ALL TO RECPT
*
 CNTTH SAVEVALUE  PRITH+,1,XF            COUNT IPG3 REQS
       SAVEVALUE  PRITH+,1,XF            COUNT IPG3 REQS
       SAVEVALUE  PRITH+,1,XF            COUNT IPG3 REQS
```

```
*********************************************************************
**                    REQUISITION RECEIPT                          **
** THE SOURCE OF EACH REQ ENTERING SYSTEM IS DETERMINED. ONLINE REQS**
** ARE SENT TO THE CPU TEST MODULE, 9MP,9MB,1Q REQS TO SKCKQ FOR    **
** STOCK CHECK AND OTHER HARD COPY REQS TO THE NSD REMOTE TERMINAL   **
** ENTRY MODULE. AFTER 9MP,9MB,1Q REQS ARE STOCK CHECKED, NIS REQS  **
** ARE TERMINATED. ALL OTHERS ARE TAGGED AS IN STOCK AND SENT TO    **
** SENT TO THE NSD REMOTE TERMINAL ENTRY MODULE.                    **
*********************************************************************
**                         NOTE:                                   **
** NON-WORK HOUR TRANSACTION HANDLING IS MANAGED THROUGHOUT THE     **
** PROGRAM BY CODE SEGMENTS SIMILAR TO THAT SEPARATED BELOW BY      **
** ASTERISKS. THE FIRST THREE TEST STATEMENTS LINK TRANSACTIONS TO   **
** THE NAMED USER CHAIN  1) DURING LUNCH;  2) DURING WORKING HOURS  **
** IF THE STORAGE IS FULL;  3) AFTER WORKING HOURS EXCEPT FOR HIGH   **
** PRIORITY TRANSACTIONS (P1=4,5,6,7) WHICH ARE ASSIGNED A PROGRESS **
** PARAMETER, REMOVED FROM THE QUEUE AND TRANSFERRED TO THE DUTY    **
** SECTION MODULE. TRANSACTIONS ARE UNLINKED FROM THE USER CHAIN TO **
** THE STORAGE ENTER BLOCK AT THE BEGINNING OF THE WORKDAY AND AFTER**
** LUNCH TO INITIALLY FILL THE STORAGE. TRANSACTIONS ARE UNLINKED   **
** AT THE END OF THE WORKDAY, SO THAT HIGH PRIORITY TRANSACTIONS    **
** MAY BE TRANSFERRED TO THE DUTY SECTION MODULE (LOW PRIORITY      **
** TRANSACTIONS ARE RELINKED). FINALLY TRANSACTIONS ARE UNLINKED    **
** TO THE STORAGE ENTER BLOCK ON A ONE FOR ONE BASIS WITH           **
** TRANSACTIONS LEAVING THE STORAGE. THIS SECTION OF CODE APPEARS   **
** IN MOST MODULES CONTAINING STORAGES, AND WILL NOT BE COMMENTED   **
** ON EXCEPT AS IT DIFFERS FROM THE STANDARD FORMAT.                **
*********************************************************************
 RECPT TRANSFER   .V$ONLIN,,NISTE      SEND ONLINE REQS TO NIS TEST,
*                                      HARD COPY REQS TO NEXT BLOCK
       TRANSFER   .V$RQDIV,,SKCKQ      SEND 1Q,9MP,9MB TO SKCKQ, ALL
*                                      OTHERS TO NEXT BLOCK
       TRANSFER   .V$GROSS,,RTETE      SEND NIS REQS TO NEXT BLOCK, ALL
*                                      OTHERS TO RTETE
       ASSIGN     6,K1                 TAG NIS REQS
       TRANSFER   ,RTETE               TRANSFER ALL TO RTETE
 SKCKQ QUEUE      QSKCK,3
**FLOW CONTROL SEGMENT*************************************************
       TEST E     BV$LUNCH,K0,SKCKL    SEND ALL TO SKCKL DURING LUNCH,
*                                      ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,SKCKT    SEND ALL TO NEXT BLOCK DURING
*                                      WORKING HOURS, ELSE SEND TO SKCKT
       TEST E     R$SKCK,K0,SKCKE      SEND ALL TO SKCKE IF STORAGE IS
*                                      NOT FULL, ELSE NEXT BLOCK
 SKCKL LINK       SKCKC,1PH            LINK TO USER CHAIN SKCKC
 SKCKT TEST GE    P1,K4,SKCKA          SEND HI PRI REQS TO NEXT BLOCK,
*                                      ALL OTHERS TO SKCKA
       ASSIGN     3,K0                 ASSIGN PROGRESS PARAMETER
       DEPART     QSKCK,3              REMOVE FROM QSKCK
       TRANSFER   ,DUTSC               SEND HI PRI REQS TO DUTSC
 SKCKA ADVANCE    1                    DUMMY
       TRANSFER   ,SKCKL               SEND ALL TO SKCKL
**END OF FLOW CONTROL SEGMENT*****************************************
 SKCKE ENTER      SKCK
 SKCKD DEPART     QSKCK,3
 SKCK  ADVANCE    V$SKCKS              STOCK CHECK ON 9MP,9MB,9Q
 SKCKV LEAVE      SKCK
       TEST E     BV$WORKH,K1,NISTR    DURING WORKING HOURS, SEND ALL TO
*                                      NEXT BLOCK, ELSE NISTR
       UNLINK     SKCKC,SKCKE,1,BACK   RELEASE ONE TRANSACTION FROM SKCKC
*
 NISTR TRANSFER   .V$GROSS,NISTM,ISTAG SEND NIS REQUISITIONS TO NISTM,
*                                      ALL OTHERS TO ISTAG
 ISTAG ASSIGN     6,K2                 TAG STOCKED CHECKED REQS
*                                      FOUND IN STOCK
       TRANSFER   ,CRTEQ               TRANSFER ALL TO CRTEQ
```

```
*************************************************************************
**                    NSD REMOTE TERMINAL ENTRY                        **
** 9MP,9MB,1Q AND ALL REQS (P1 = 3,4,5,6,7) ENTERED VIA CUST SERV      **
** RTE, REQS (P1 = 1,2) ARE ENTERED VIA DPSC RTE. NIS REQS ARE         **
** TRANSFERRED TO TERMINATION AND ALL OTHERS ARE SENT TO THE CPU       **
** CPU TEST MODULE.                                                    **
*************************************************************************
*
 RTETE TEST GE    P1,K3,DRTEQ          SEND IPG3 AND NON 1Q,9MB,9MP IPG2
*                                      REQS TO DRTEQ, ALL OTHERS TO NEXT
*                                      BLOCK
*
**CUSTOMER SERVICES REMOTE TERMINAL ENTRY*****************************
*
 CRTEQ QUEUE      QCRTE,3
       TEST E     BV$LUNCH,K0,CRTEL    SEND ALL TO CRTEL DURING LUNCH,
*                                      ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,CRTET    SEND ALL TO NEXT BLOCK DURING
*                                      WORKING HOURS, ELSE SEND TO CRTET
       TEST E     R$CRTE,K0,CRTEE      SEND ALL TO CRTEE IF STORAGE IS
*                                      NOT FULL, ELSE NEXT BLOCK
 CRTEL LINK       CRTEC,1PH            LINK TO USER CHAIN CRTEC
 CRTET TEST GE    P1,K4,CRTEA          SEND HI PRI REQS TO NEXT BLOCK,
*                                      ALL OTHERS TO CRTEA
       ASSIGN     3,K1                 ASSIGN PROGRESS PARAMETER
       DEPART     QCRTE,3              REMOVE FROM QCRTE
       TRANSFER   ,DUTSC               SEND HI PRI REQS TO DUTSC
 CRTEA ADVANCE    1                    DUMMY
       TRANSFER   ,CRTEL               SEND ALL TO CRTEL
 CRTEE ENTER      CRTE
       DEPART     QCRTE,3
 CRTE  ADVANCE    V$RTES               ENTER REQS VIA CUST SERV RTE
       LEAVE      CRTE
       TEST E     BV$WORKH,K1,CSTR
       UNLINK     CRTEC,CRTEE,1,BACK   RELEASE ONE TRANSACTION FROM CTWO
*
 CSTR  TEST E     P6,1,PRTE            SEND NIS REQS TO NEXT BLOCK, ALL
*                                      OTHER TO PRTE
       TRANSFER   ,NISTM               TRANSFER NIS REQS TO NISTM
*
**DPSC REMOTE TERMINAL ENTRY*******************************************
*
 DRTEQ QUEUE      QDRTE,3
       TEST E     BV$WORKH,K1,DRTEL    SEND ALL TO NEXT BLOCK DURING
*                                      WORKING HOURS, ELSE SEND TO DRTEL
       TEST E     R$DRTE,K0,DRTEE      SEND ALL TO DRTEE IF STORAGE IS
*                                      NOT FULL, ELSE NEXT BLOCK
 DRTEL LINK       DRTEC,1PH            LINK TO USER CHAIN DRTEC
 DRTEE ENTER      DRTE
       DEPART     QDRTE,3
 DRTE  ADVANCE    V$RTES               ENTER REQS VIA DPSC RTE
       LEAVE      DRTE
       TEST E     BV$WORKH,K1,DPTE
       UNLINK     DRTEC,DRTEE,1,BACK   RELEASE ONE TRANSACTION FROM DRTEC
*
 DPTE  TEST E     P6,1,PRTE            SEND NIS REQS TO NEXT BLOCK, ALL
*                                      OTHER TO PRINTER TEST
       TRANSFER   ,NISTM               TRANSFER NIS REQS TO NISTM
```

```
*************************************************************************
**                          CPU TESTS                                  **
** TEST FOR, PROCESS AND RE-ENTER DEMAND EXCEPTIONS. TEST FOR AND     **
** TRANSFER ONLINE NIS REQS. ROUTE IPG3 AND NON 9MP,9MB,9MF AND  1Q **
** IPG2 REQS TO STOR CONT PRINTER, BALANCE TO CUST SERV PRINTER IN  **
** THE PRINTER QUEUE HANDLING MODULE.                               **
*************************************************************************
*
 NISTE TRANSFER   .V$GROSS,NISTM,PRTE  SEND NIS REQS TO NISTM, ALL
*                                      OTHERS TO PRTE
*
 PRTE  TEST L     P1,K3,CSPRQ          SEND REQS (P1 = 3,4,5,6,7) TO
*                                      CSPRQ, ALL OTHERS TO NEXT BLOCK
*
       TRANSFER   .V$PROV,SCPRQ,CSPRQ  SEND 9MF,9MP,9MB,1Q REQS TO
*                                      CSPRQ, ALL OTHERS TO SCPRQ
```

```
*************************************************************************
**                PRINTER QUEUE HANDLING                               **
** LINK IPG3 REQS ON USER CHAIN THREE, UNLINK THEM TO PRINT ISSUE      **
** DOCUMENTS IN STORAGE CONTROL AT 0800 ON WORKDAYS. LINK IPG2 REQS    **
** ON USER CHAIN TWO, UNLINK THEM TO PRINT ISSUE DOCUMENTS IN          **
** STORAGE CONTROL AT 0800,1000,1245,1445 ON WORKDAYS. LINK ALL        **
** IPG1,BWT,CASREPT,QUICK PICK,9MF,9MP,9MB,1Q REQS ON USER CHAIN       **
** ONE, UNLINK TO PRINT  ISSUE DOCUMENTS ON THE CUST SERV PRINTER      **
** EVERY FIVE MINUTES. ALL ISSUE DOCS PRINTED ALL SENT TO THE          **
** DEMAND EXCEPTION HANDLING MODULE. PRINTER OPERATIONS ARE            **
** MODELED BY THE CONTROL TRANSACTION IN THE PARTIONED SCHEDULE        **
** CONTROL SECTION.                                                    **
*************************************************************************
*
**PRINTER CONTROL SECTION*************************************************
*
       GENERATE   25                    GENERATE CONTROL TRANSACTION TO
*                                       TRIGGER PRINTER EVERY 15 MIN
*
       UNLINK     THREE,SCPRE,ALL,BV$PRTHR
*                                       SEND ALL REQS ON USER CHAIN THREE
*                                       TO THE STORAGE CONTROL PRINTER
*
       UNLINK     TWO,SCPRE,ALL,BV$PRTWO
*                                       SEND ALL REQS ON USER CHAIN TWO
*                                       TO THE STORAGE CONTROL PRINTER
*
       TERMINATE                        TERMINATE CONTROL TRANSACTION
*
       GENERATE   5                     GENERATE CONTROL TRANSACTION TO
*                                       TRIGGER CUST SERV PRINTER EVERY
*                                       5 MINUTES
*
 UNLNK UNLINK     ONE,CSPRE,ALL,BACK     SEND ALL REQS ON USER CHAIN ONE
*                                       TO THE CUST SERV PRINTER
*
       TERMINATE                        TERMINATE CONTROL TRANSACTION
*
**STORAGE CONTROL PRINTER OPERATIONS SECTION**************************
*
 SCPRQ QUEUE      QSCPR,3                ENTER STORAGE CONT PRINTER QUEUE
*
       TEST E     P1,K1,LKTWO            SEND IPG2 REQS TO LKTWO,
*                                       IPG3 TO NEXT BLOCK
*
       LINK       THREE,1PH              LINK IPG3 ON USER CHAIN THREE
 LKTWO LINK       TWO,1PH                LINK IPG2 ON USER CHAIN TWO
*
 SCPRE ENTER      SCPR
       DEPART     QSCPR,3                DEPART QUEUE
 SCPR  ADVANCE                           PRINT ISSUE DOCS
       LEAVE      SCPR
*
       TRANSFER   ,DEXTE                 TRANSFER ALL TO DEXTE
*
**CUSTOMER SERVICES PRINTER OPERATIONS SECTION************************
*
 CSPRQ QUEUE      QCSPR,3                ENTER CUST SERV PRINTER QUEUE
*
       LINK       ONE,1PH                LINK ALL TO USER CHAIN ONE
*
 CSPRE ENTER      CSPR
       DEPART     QCSPR,3                DEPART QUEUE
 CSPR  ADVANCE                           PRINT ISSUE DOCS
       LEAVE      CSPR
```

```
*********************************************************************
**                  DEMAND EXCEPTION HANDLING                      **
** TRANSACTIONS ARE RECEIVED FROM THE PRINTER QUEUE HANDLING MODULE **
** AND THE WAREHOUSE MODULE. PREVIOUSLY PROCESSED DEMAND EXCEPTIONS **
** ARE SENT TO THE WAREHOUSE ASSIGNMENT MODULE, WAREHOUSE REFUSALS  **
** ARE PROCESSED AS SUCH AND TERMINATED. NEW DEMAND EXCEPTIONS ARE  **
** PROCESSED, TAGGED AS COMPLETED AND SENT BACK TO THE PRINTER      **
** QUEUE HANDLING MODULE. TRANSACTIONS NOT RESULTING IN DEMAND      **
** EXCEPTIONS ARE SENT DIRECTLY TO THE WAREHOUSE ASSIGNMENT MODULE. **
*********************************************************************
*
 DEXTE TEST NE    P7,K1,LOCAS          SEND PROCESSED DEMAND EXCEPTIONS
*                                      TO LOCAS, OTHERS TO NEXT BLOCK
       TRANSFER   .V$NOTEX,,LOCAS      SEND REQS WITH DEMAND EXCEPTIONS
*                                      TO NEXT BLOCK, SEND OTHERS TO
*                                      LOCAS
 DEEXQ QUEUE      QDEEX,3
       TEST E     BV$LUNCH,K0,DEEXL    SEND ALL TO DEEXL DURING LUNCH,
*                                      ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,DEEXT    SEND ALL TO NEXT BLOCK DURING
*                                      WORKING HOURS, ELSE SEND TO DEEXT
       TEST E     R$DEEX,K0,DEEXE      SEND ALL TO DEEXE IF STORAGE IS
*                                      NOT FULL, ELSE NEXT BLOCK
 DEEXL LINK       DEEXC,1PH            LINK TO USER CHAIN DEEXC
 DEEXT TEST GE    P1,K4,DEEXA          SEND HI PRI REQS TO NEXT BLOCK,
*                                      ALL OTHERS TO DEEXA
       TEST NE    P8,K1,DEEXA          SEND WAREHOUSE REFUSALS TO DEEXA,
*                                      ALL OTHERS TO NEXT BLOCK
       ASSIGN     3,K3                 ASSIGN PROGRESS PARAMETER
       DEPART     QDEEX,3              REMOVE FROM QDEEX
       TRANSFER   ,DUTSC               SEND HI PRI REQS TO DUTSC
 DEEXA ADVANCE    1                    DUMMY
       TRANSFER   ,DEEXL               SEND ALL TO DEEXL
 DEEXE ENTER      DEEX
       DEPART     QDEEX,3              REMOVE FROM USER CHAIN QDEEX
 DEEX  ADVANCE    V$DEEXS              PROCESS DEMAND EXCEPT./WAR. REF.
       LEAVE      DEEX
       ASSIGN     7,K1                 TAG PROCESSED DEMAND EXCEPTIONS
       TEST E     BV$WORKH,K1,WRTE     DURING WORKING HOURS SEND ALL TO
*                                      NEXT BLOCK, ELSE WRTE
       UNLINK     DEEXC,DEEXE,K1,BACK  RELEASE ONE TRANSACTION FROM DEEXC
 WRTE  TEST E     P8,K1,PRTE           SEND WAREHOUSE REFUSALS TO NEXT
*                                      BLOCK, ALL OTHERS TO PRTE
*
       TRANSFER   ,WRTRM               TRANSFER ALL TO WRTRM
```

```
*************************************************************************
**              WAREHOUSE ASSIGNMENT MODULE                            **
** ALL ISSUE DOCUMENTS ARE ASSIGNED A WAREHOUSE LOCATION. THOSE        **
** ISSUE DOCUMENTS IDENTIFIED AS WAREHOUSE REFUSALS ARE TAGGED AS      **
** SUCH. BEARER WALKTHROUGH ISSUE DOCS ARE TAGGED AND ARE              **
** TRANSFERRED TO THE WAREHOUSE MODULE WITH A DELAY ASSIGNED BY        **
** LOCATION. ALL OTHER ISSUE DOCUMENTS ARE SENT TO THE STORAGE         **
** OFFICE/STORAGE CONTROL MODULE.                                      **
*************************************************************************
*
 LOCAS ASSIGN     2,FN$FTWO             ASSIGN WAREHOUSE LOCATION TO P2
*
       TRANSFER   .V$NOTWR,,DESTE       SEND WAREHOUSE REFUSALS TO NEXT
*                                       BLOCK, ALL OTHERS TO DESTE
       ASSIGN     8,K1                  TAG WAREHOUSE REFUSALS
*
 DESTE TEST NE    P1,K5,BWTAD           SEND IPG2 BWT TO BWTAD,
*                                       ALL OTHERS TO NEXT BLOCK
*
       TEST NE    P1,K7,BWTAD           SEND IPG1 BWT TO BWTAD,
*                                       ALL OTHERS TO NEXT BLOCK
*
       TEST G     P2,K3,STOFQ           SEND PROV. REQS TO STORAGE OFF,
*                                       ALL OTHERS TO NEXT BLOCK
*
       TRANSFER   ,SCNTQ                TRANSFER ALL TO SCNTQ
*
 BWTAD ADVANCE    FN$FTHSV              DELAY TO SIMULATE BEARER
*                                       TRANSPORTATION TO THE WAREHOUSE
*
       TRANSFER   FN,FTHTW              SENT ALL TO RESPECTIVE WAREHOUSE
*
```

```
*************************************************************************
**          STORAGE CONTROL/STORAGE OFFICE                             **
** PROVISIONS ISSUE DOCUMENTS ENTER AT STOFQ, ALL OTHERS AT SCNTQ.      **
** ISSUE DOCUMENTS ARE MARKED, BURST AND SORTED BY LOCATION. ALL        **
** ISSUE DOCUMENTS EXCEPT THOSE BOUND FOR YOKOHAMA COLD STORAGE ARE     **
** SENT TO THE BIKE MESSENGER DELIVERY MODULE. YOKOHAMA ISSUE DOCS      **
** ARE SENT TO THE YOKOHAMA ISSUE DOCUMENT DELIVERY MODULE.             **
*************************************************************************
*
**STORAGE CONTROL SECTION*****************************************
*
 SCNTQ QUEUE      QSCNT,3
       TEST E     BV$LUNCH,K0,SCNTL     SEND ALL TO SCNTL DURING LUNCH,
*                                        ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,SCNTT     SEND ALL TO NEXT BLOCK DURING
*                                        WORKING HOURS, ELSE SEND TO SCNTT
       TEST E     R$SCNT,K0,SCNTE       SEND ALL TO SCNTE IF STORAGE IS
*                                        NOT FULL, ELSE NEXT BLOCK
 SCNTL LINK       SCNTC,1PH             LINK TO USER CHAIN SCNTC
 SCNTT TEST GE    P1,K4,SCNTA           SEND HI PRI REQS TO NEXT BLOCK,
*                                        ALL OTHERS TO SCNTA
       ASSIGN     3,K4                  ASSIGN PROGRESS PARAMETER
       DEPART     QSCNT,3               REMOVE FROM QSCNT
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 SCNTA ADVANCE    1                     DUMMY
       TRANSFER   ,SCNTL                SEND ALL TO SCNTL
 SCNTE ENTER      SCNT
       DEPART     QSCNT,3
 SCNT  ADVANCE    V$SCSOS               MARK,BURST,SORT ISSUE DOCS
       LEAVE      SCNT
       TEST E     BV$WORKH,K1,SCTE      DURING WORKING HOURS SEND ALL TO
*                                        NEXT BLOCK, ELSE TO SCTE
       UNLINK     SCNTC,SCNTE,1,BACK    RELEASE ONE TRANSACTION FROM SCNTC
*
 SCTE  TRANSFER   ,BIKEQ                SEND ALL TO BIKEQ
*
**STORAGE OFFICE SECTION******************************************
*
 STOFQ QUEUE      QSTOF,3
       TEST E     BV$LUNCH,K0,STOFL     SEND ALL TO STOFL DURING LUNCH,
*                                        ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,STOFT     SEND ALL TO NEXT BLOCK DURING
*                                        WORKING HOURS, ELSE SEND TO STOFT
       TEST E     R$STOF,K0,STOFE       SEND ALL TO STOFE IF STORAGE IS
*                                        NOT FULL, ELSE NEXT BLOCK
 STOFL LINK       STOFC,1PH             LINK TO USER CHAIN STOFC
 STOFT TEST GE    P1,K4,STOFA           SEND HI PRI REQS TO NEXT BLOCK,
*                                        ALL OTHERS TO STOFA
       ASSIGN     3,K5                  ASSIGN PROGRESS PARAMETER
       DEPART     QSTOF,3               REMOVE FROM QSTOF
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 STOFA ADVANCE    1                     DUMMY
       TRANSFER   ,STOFL                SEND ALL TO STOFL
 STOFE ENTER      STOF
       DEPART     QSTOF,3               REMOVE FROM QSTOF
 STOF  ADVANCE    V$SCSOS               MARK,BURST,SORT ISSUE DOCS
       LEAVE      STOF
       TEST E     BV$WORKH,K1,SOTE      DURING WORKING HOURS SEND ALL TO
*                                        NEXT BLOCK, ELSE TO SOTE
       UNLINK     STOFC,STOFE,1,BACK    RELEASE ONE TRANSACTION FROM STOFC
*
 SOTE  TEST E     P2,K1,BIKEQ           SEND YOKOHAMA CS DOCS TO NEXT
*                                        BLOCK, SEND ALL OTHERS TO BIKEQ
*
       TRANSFER   ,DLVRT                SEND ALL TO DLVRT
```

```
*************************************************************************
**          YOKOHAMA ISSUE DOCUMENT DELIVERY                           **
** DELIVERY OF ISSUE DOCUMENTS BY PICKUP TRUCK IS SIMULATED IN THIS **
** MODULE. ISSUE DOCS ARRIVING ARE PLACED ON USER CHAIN DLVRC WHICH **
** IS UNLINKED TO YMCSQ WITH AN APPROPRIATE TIME DELAY AT 0830 ON   **
** WORKDAYS. BECAUSE DURING ACTUAL OPERATIONS, HIGH PRIORITY ISSUE  **
** DOCUMENTS ARRIVING AFTER 0830 ARE NOT DELAYED UNTIL THE NEXT DAY,**
** THOSE HIGH PRIORITY DOCUMENTS ARRIVING DURING THE WORKDAY AFTER  **
** 0830 ARE TRANSFERRED DIRECTLY TO YMCSQ TO AVOID UNREALISTIC      **
** DELAYS ON THE DLVRC USER CHAIN. HIGH PRIORITY ISSUE DOCUMENTS    **
** ARRIVING AFTER WORKING HOURS OR ON WEEKENDS ARE TRANSFERRED TO   **
** THE DUTY SECTION MODULE. PICKUP DELIVERY OPERATION SCHEDULING IS **
** CONTROLLED BY THE PARTIONED SCHEDULE CONTROL SECTION.            **
*************************************************************************
*
**SCHEDULE CONTROL SECTION*************************************************
*
       GENERATE   2400,,850              GENERATE CONTROL TRANSACTION TO
*                                        TRIGGER YOKOHAMA DELIVERY
       UNLINK     DLVRC,DLVRE,ALL,BV$WKDAY
*                                        SEND ISSUE DOCS ON DELIVER USER
*                                        CHAIN TO DLVRE
*
       TERMINATE                         TERMINATE CONTROL TRANSACTION
*
**OPERATIONS SECTION*******************************************************
*
 DLVRT TEST G     P1,K3,DLVRQ             SEND LOW PRI ISSUE DOCS TO DLVRQ,
*                                        ALL OTHERS TO NEXT BLOCK
       TEST E     BV$OPEN,K1,DLVTR        IF OUTSIDE OF DEPOT WORKING HOURS,
*                                        SEND TO DLVTR, ELSE NEXT BLOCK
       TEST G     V$TIME,K0850,DLVRQ      IF AFTER DAILY RUN, SEND TO NEXT
*                                        BLOCK, ELSE DLVRQ
       TRANSFER   ,YMCSQ                  TRANSFER ALL TO YMCSQ
*
 DLVTR ASSIGN     3,K6                    ASSIGN PROGRESS PARAMETER
       TRANSFER   ,DUTSC                  SEND ALL TO DUTSC
*
 DLVRQ QUEUE      QDLVR,3                 ENTER QUEUE FOR REQ DELIVERY
*                                        TO YOKOHAMA CS
*
 DLVRL LINK       DLVRC,1PH               WAIT ON USER CHAIN DLVRC
*
 DLVRE ENTER      DLVR
       DEPART     QDLVR,3                 DEPART QUEUE
 DLVR  ADVANCE    150,50                  DELIVERY TO YOKOHAMA
       LEAVE      DLVR
*
       TRANSFER   ,YMCSQ                  TRANSFER ALL TO YOKOHAMA COLD
*                                        STORAGE QUEUE
```

```
*************************************************************************
**                BICYCLE MESSENGER DELIVERY                           **
** THIS MODULE DELIVERS ISSUE DOCUMENTS TO WAREHOUSE LOCATIONS BY      **
** BICYCLE MESSENGER AT 0900,1100,1345 AND 1515 ON WORKDAYS. HIGH      **
** PRIORITY REQS ARRIVING DURING WORKING HOURS AFTER THE LAST RUN      **
** ARE TRANSFERRED TO THE WAREHOUSE MODULE DIRECTLY TO SIMULATE        **
** DELIVERY BY OFFICE PERSONNEL IN ACCORDANCE WITH ACTUAL              **
** PROCEDURES. THE SCHEDULE CONTROL SECTION IS PARTIONED IN THE        **
** TOP HALF OF THE MODULE.                                             **
*************************************************************************
*
**SCHEDULE CONTROL SECTION*************************************************
*
       GENERATE   25                     GENERATE CONTROL TRANSACTION TO
*                                        TRIGGER PRINTER EVERY 15 MIN
*
       UNLINK     BIKEC,BIKEE,ALL,BV$DTIME
*                                        SEND ALL ISSUE DOCS ON USER CHAIN
*                                        BIKEC TO BIKEQ
*
       TERMINATE                         TERMINATE CONTROL TRANSACTION
*
**OPERATIONS SECTION*******************************************************
*
 BIKEQ QUEUE      QBIKE,3
       TEST GE    P1,K4,BIKEL           SEND LOW PRI REQS TO BIKEL,
*                                        ALL OTHERS TO NEXT BLOCK
       TEST G     V$TIME,K1525,BIKEL    IF BEFORE LAST MESSENGER RUN, SEND
*                                        ALL TO BIKEL, ELSE NEXT BLOCK
       TEST L     V$TIME,K1676,BIKTR    IF DURING WORKING HOURS SEND TO
*                                        NEXT BLOCK, ELSE BIKTR
*
       DEPART     QBIKE,3
       ADVANCE    FN$FTHSV              OFFICE PERSONNEL DELIVER
       TRANSFER   ,WHTR                 SEND HI PRI REQS TO WHTR
*
 BIKTR DEPART     QBIKE,3
       ASSIGN     3,K7                  ASSIGN PROGRESS PARAMETER
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
*
 BIKEL LINK       BIKEC,1PH             LINK ALL ISSUE DOCUMENTS AWAITING
*                                        TRANSPORTATION TO BIKEC
*
 BIKEE ENTER      BIKE
       DEPART     QBIKE,3
 BIKE  ADVANCE    FN$FTHSX              DELIVER ISSUE DOCS TO WAREHOUSES
       LEAVE      BIKE
```

```
*************************************************************************
**                        WAREHOUSES                                   **
** ISSUE DOCUMENTS ARE SENT TO THE WAREHOUSE INDICATED BY P2.         **
** PICKING, STAGING AND SHIPMENT PREPARATION (PROVISIONS WAREHOUSES **
** ONLY) FUNCTIONS ARE SIMULATED. WAREHOUSE REFUSALS ARE TRANSFERRED**
** TO THE DEMAND EXCEPTION MODULE FOR PROCESSING. BWT AND QUICK     **
** PICK ISSUES ARE TRANSFERRED TO TERMINATION AS WELL AS ISSUES     **
** MADE AVAILABLE FOR SHIPMENT DIRECTLY FROM PROVISIONS WAREHOUSES. **
** ISSUES FROM YOKOSUKA COLD STORAGE AND B-47 REQUIRING PACKING     **
** OR SHIPMENT FROM THE FREIGHT TERMINAL ARE TRANSFERRED TO THE     **
** PROVISIONS TRACTOR TRAIN MODULE. ALL OTHER ISSUES FROM GENERAL   **
** STORAGE LOCATIONS ARE SENT TO THE TRACTOR TRAIN DELIVERY MODULE. **
** WAREHOUSE SUBMODULES ARE PARTIONED AND LABELED.                  **
*************************************************************************
*
 WHTR  TRANSFER   FN,FTHTW              TRANSFER ISSUE DOCS TO STORAGE
*                                       LOCATION
*
*YOKOHAMA COLD STORAGE*************************************************
*
 YMCSQ QUEUE      QYMCS,3
       TEST E     BV$LUNCH,K0,YMCSL     SEND ALL TO YMCSL DURING LUNCH,
*                                       ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,YMCST     SEND ALL TO NEXT BLOCK DURING
*                                       WORKING HOURS, ELSE SEND TO YMCST
       TEST E     R$YMCS,K0,YMCSE       SEND ALL TO YMCSE IF STORAGE IS
*                                       NOT FULL, ELSE NEXT BLOCK
 YMCSL LINK       YMCSC,1PH             LINK TO USER CHAIN YMCSC
 YMCST TEST GE    P1,K4,YMCSA           SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO YMCSA
       ASSIGN     3,K8                  ASSIGN PROGRESS PARAMETER
       DEPART     QYMCS,3               REMOVE FROM QYMCS
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 YMCSA ADVANCE    1                     DUMMY
       TRANSFER   ,YMCSL                SEND ALL TO YMCSL
 YMCSE ENTER      YMCS
       DEPART     QYMCS,3
 YMCS  ADVANCE    V$YMCSS               PICK, PREPARE FOR SHIP AND STAGE
       LEAVE      YMCS
       TEST E     BV$WORKH,K1,YMTE      DURING WORKING HOURS SEND ALL TO
*                                       NEXT BLOCK, ELSE TO YMTE
       UNLINK     YMCSC,YMCSE,1,BACK    RELEASE ONE TRANSACTION FROM YMCSC
*
 YMTE  TEST NE    P8,K1,DEEXQ           SEND WAREHOUSE REFUSALS TO
*                                       EXCEPTION HANDLING
*
       TRANSFER   ,TERM                 TERMINATE REQS AVAILABLE FOR
*                                       SHIPMENT
```

```
**YOKOSUKA COLD STORAGE*************************************************
 YKCSQ QUEUE      QYKCS,3
       TEST E     BV$LUNCH,K0,YKCSL     SEND ALL TO YKCSL DURING LUNCH,
*                                       ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,YKCST     SEND ALL TO NEXT BLOCK DURING
*                                       WORKING HOURS, ELSE SEND TO YMCST
       TEST E     R$YKCS,K0,YKCSE       SEND ALL TO YKCSE IF STORAGE IS
*                                       NOT FULL, ELSE NEXT BLOCK
 YKCSL LINK       YKCSC,1PH             LINK TO USER CHAIN YKCSC
 YKCST TEST GE    P1,K4,YKCSA           SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO YKCSA
       ASSIGN     3,K9                  ASSIGN PROGRESS PARAMETER
       DEPART     QYKCS,3               REMOVE FROM QYKCS
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 YKCSA ADVANCE    1                     DUMMY
       TRANSFER   ,YKCSL                SEND ALL TO YKCSL
 YKCSE ENTER      YKCS
       DEPART     QYKCS,3
 YKCS  ADVANCE    V$YKCSS               PICK AND STAGE MATERIAL
       LEAVE      YKCS
       TEST E     BV$WORKH,K1,YKTE      DURING WORKING HOURS SEND ALL TO
*                                       NEXT BLOCK, ELSE TO YKTE
       UNLINK     YKCSC,YKCSE,1,BACK    RELEASE ONE TRANSACTION FROM YKCSC
*
 YKTE  TEST NE    P8,K1,DEEXQ           SEND WAREHOUSE REFUSALS TO
*                                       EXCEPTION HANDLING
*
       TEST E     BV$BEAR,K0,TERM       SEND BEARER ISSUES TO TERM,
*                                       ALL OTHERS TO NEXT BLOCK
*
       ASSIGN     4,FN$FFOUR            ASSIGN ISSUE DESTINATIONS TO P4
*
       ASSIGN     5,V$YKCSW             ASSIGN ISSUE WEIGHT
*
       TEST NE    P4,K1,TERM            SEND ISSUES FOR PACKING OR FREIGHT
*                                       TERMINAL SECTION TO NEXT BLOCK,
*                                       ALL OTHERS TO TERM
*
       TRANSFER   ,PTRNQ                TRANSFER ALL TO PTRNQ
```

```
**B-47 (DRY PROVISIONS)************************************************
 DRYWQ QUEUE       QDRYW,3
       TEST E      BV$LUNCH,K0,DRYWL     SEND ALL TO DRYWL DURING LUNCH,
*                                        ELSE NEXT BLOCK
       TEST E      BV$WORKH,K1,DRYWT     SEND ALL TO NEXT BLOCK DURING
*                                        WORKING HOURS, ELSE SEND TO DRYWT
       TEST E      R$DRYW,K0,DRYWE       SEND ALL TO DRYWE IF STORAGE IS
*                                        NOT FULL, ELSE NEXT BLOCK
 DRYWL LINK        DRYWC,1PH             LINK TO USER CHAIN DRYWC
 DRYWT TEST GE     P1,K4,DRYWA           SEND HI PRI REQS TO NEXT BLOCK,
*                                        ALL OTHERS TO DRYWA
       ASSIGN      3,K10                 ASSIGN PROGRESS PARAMETER
       DEPART      QDRYW,3               REMOVE FROM QDRYW
       TRANSFER    ,DUTSC                SEND HI PRI REQS TO DUTSC
 DRYWA ADVANCE     1                     DUMMY
       TRANSFER    ,DRYWL                SEND ALL TO DRYWL
 DRYWE ENTER       DRYW
       DEPART      QDRYW,3
 DRYW  ADVANCE     V$DRYWS               PICK AND STAGE MATERIAL
       LEAVE       DRYW
       TEST E      BV$WORKH,K1,DRYT      DURING WORKING HOURS SEND ALL TO
*                                        NEXT BLOCK, ELSE TO DRYT
       UNLINK      DRYWC,DRYWE,1,BACK    RELEASE ONE TRANSACTION FROM DRYWC
*
 DRYT  TEST NE     P8,K1,DEEXQ           SEND WAREHOUSE REFUSALS TO
*                                        EXCEPTION HANDLING
*
       TEST E      BV$BEAR,K0,TERM       SEND BEARER ISSUES TO TERM, ALL
*                                        OTHERS TO NEXT BLOCK
*
       ASSIGN      4,FN$FFIVE            ASSIGN ISSUE DESTINATION
*
       ASSIGN      5,V$DRYWW             ASSIGN ISSUE WEIGHT
*
       TEST NE     P4,K1,TERM            SEND ISSUES FOR PACKING OR FREIGHT
*                                        TERMINAL SECTION TO NEXT BLOCK,
*                                        ALL OTHERS TO TERM
*
       TRANSFER    ,PTRNQ                TRANSFER ALL TO PTRNQ
```

```
*A WAREHOUSE AREA (A-19)************************************************
 AWHEQ QUEUE      QAWHE,3
       TEST E     BV$LUNCH,K0,AWHEL     SEND ALL TO AWHEL DURING LUNCH,
*                                       ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,AWHET     SEND ALL TO NEXT BLOCK DURING
*                                       WORKING HOURS, ELSE SEND TO AWHET
       TEST E     R$AWHE,K0,AWHEE       SEND ALL TO AWHEE IF STORAGE IS
*                                       NOT FULL, ELSE NEXT BLOCK
 AWHEL LINK       AWHEC,1PH             LINK TO USER CHAIN AWHEC
 AWHET TEST GE    P1,K4,AWHEA           SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO AWHEA
       ASSIGN     3,K11                 ASSIGN PROGRESS PARAMETER
       DEPART     QAWHE,3               REMOVE FROM QAWHE
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 AWHEA ADVANCE    1                     DUMMY
       TRANSFER   ,AWHEL                SEND ALL TO AWHEL
 AWHEE ENTER      AWHE
       DEPART     QAWHE,3
 AWHE  ADVANCE    V$AWHES               PICK AND BIN MATERIAL
       LEAVE      AWHE
       TEST E     BV$WORKH,K1,AWHT      DURING WORKING HOURS SEND ALL TO
*                                       NEXT BLOCK, ELSE TO AWHT
       UNLINK     AWHEC,AWHEE,1,BACK    RELEASE ONE TRANSACTION FROM AWHEC
*
 AWHT  TEST NE    P8,K1,DEEXQ           SEND WAREHOUSE REFUSALS TO
*                                       EXCEPTION HANDLING
*
       TEST E     BV$BEAR,K0,TERM       SEND BEARER ISSUES TO TERM, ALL
*                                       OTHERS TO NEXT BLOCK
*
       ASSIGN     4,FN$FSIX             ASSIGN ISSUE DESTINATION
       ASSIGN     5,V$AWHEW             ASSIGN ISSUE WEIGHT
*
       TEST G     V$TIME,1450,AQUE      IF LAST TRACTOR TRAIN OF DAY HAS
*                                       DEPARTED, SEND TO NEXT BLOCK, ELSE
*                                       AQUE
       TEST GE    P1,K4,AQUE            SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO AQUE
*
       ASSIGN     3,K17                 ASSIGN PROGRESS PARAMETER
*
       TRANSFER   ,DUTSC                TRANSFER ALL TO DUTSC
*
 AQUE  QUEUE      QBTRN,3
 ALINK LINK       ACH,1PH               PLACE TRANSACTIONS ON A USER CHAIN
*                                       AWAITING ON-BASE TRANSPORTATION
```

```
**B WAREHOUSE AREA (B-34,B-45,B-46)************************************
 BWHEQ QUEUE      QBWHE,3
       TEST E     BV$LUNCH,K0,BWHEL     SEND ALL TO BWHEL DURING LUNCH,
*                                       ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,BWHET     SEND ALL TO NEXT BLOCK DURING
*                                       WORKING HOURS, ELSE SEND TO BWHET
       TEST E     R$BWHE,K0,BWHEE       SEND ALL TO BWHEE IF STORAGE IS
*                                       NOT FULL, ELSE NEXT BLOCK
 BWHEL LINK       BWHEC,1PH             LINK TO USER CHAIN BWHEC
 BWHET TEST GE    P1,K4,BWHEA           SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO BWHEA
       ASSIGN     3,K12                 ASSIGN PROGRESS PARAMETER
       DEPART     QBWHE,3               REMOVE FROM QBWHE
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 BWHEA ADVANCE    1                     DUMMY
       TRANSFER   ,BWHEL                SEND ALL TO BWHEL
 BWHEE ENTER      BWHE
       DEPART     QBWHE,3
 BWHE  ADVANCE    V$BWHES               PICK AND STAGE MATERIAL
       LEAVE      BWHE
       TEST E     BV$WORKH,K1,BWHT      DURING WORKING HOURS SEND ALL TO
*                                       NEXT BLOCK, ELSE TO BWHT
       UNLINK     BWHEC,BWHEE,1,BACK    RELEASE ONE TRANSACTION FROM BWHEC
*
 BWHT  TEST NE    P8,K1,DEEXQ           SEND WAREHOUSE REFUSALS TO
*                                       EXCEPTION HANDLING
*
       TEST E     BV$BEAR,K0,TERM       SEND BEARER ISSUES TO TERM, ALL
*                                       OTHERS TO NEXT BLOCK
*
       ASSIGN     4,FN$FSEVE            ASSIGN ISSUE DESTINATION
       ASSIGN     5,V$BWHEW             ASSIGN ISSUE WEIGHT
*
       TEST G     V$TIME,1433,BQUE      IF LAST TRACTOR TRAIN OF DAY HAS
*                                       DEPARTED, SEND TO NEXT BLOCK, ELSE
*                                       BQUE
       TEST GE    P1,K4,BQUE            SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO BQUE
*
       ASSIGN     3,K18                 ASSIGN PROGRESS PARAMETER
*
       TRANSFER   ,DUTSC                TRANSFER ALL TO DUTSC
*
 BQUE  QUEUE      QBTRN,3
 BLINK LINK       BCH,1PH               PLACE TRANSACTIONS ON A USER CHAIN
*                                       AWAITING ON-BASE TRANSPORTATION
```

```
**F-157**********************************************************************
 MAINQ QUEUE      QMAIN,3
       TEST E     BV$LUNCH,K0,MAINL     SEND ALL TO MAINL DURING LUNCH,
*                                       ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,MAINT     SEND ALL TO NEXT BLOCK DURING
*                                       WORKING HOURS, ELSE SEND TO MAINT
       TEST E     R$MAIN,K0,MAINE       SEND ALL TO MAINE IF STORAGE IS
*                                       NOT FULL, ELSE NEXT BLOCK
 MAINL LINK       MAINC,1PH             LINK TO USER CHAIN MAINC
 MAINT TEST GE    P1,K4,MAINA           SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO MAINA
       ASSIGN     3,K13                 ASSIGN PROGRESS PARAMETER
       DEPART     QMAIN,3               REMOVE FROM QMAIN
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 MAINA ADVANCE    1                     DUMMY
       TRANSFER   ,MAINL                SEND ALL TO MAINL
 MAINE ENTER      MAIN
       DEPART     QMAIN,3
 MAIN  ADVANCE    V$MAINS               PICK AND STAGE MATERIAL
       LEAVE      MAIN
       TEST E     BV$WORKH,K1,TMAIN     DURING WORKING HOURS SEND ALL TO
*                                       NEXT BLOCK, ELSE TO TMAIN
       UNLINK     MAINC,MAINE,1,BACK    RELEASE ONE TRANSACTION FROM MAINC
*
 TMAIN TEST NE    P8,K1,DEEXQ           SEND WAREHOUSE REFUSALS TO
*                                       EXCEPTION HANDLING
*
       TEST E     BV$BEAR,K0,TERM       SEND BEARER ISSUES TO TERM, ALL
*                                       OTHERS TO NEXT BLOCK
*
       ASSIGN     4,FN$FEIGH            ASSIGN ISSUE DESTINATION
       ASSIGN     5,V$MAINW             ASSIGN ISSUE WEIGHT
*
       TEST G     V$TIME,1410,MQUE      IF LAST TRACTOR TRAIN OF DAY HAS
*                                       DEPARTED, SEND TO NEXT BLOCK, ELSE
*                                       MQUE
       TEST GE    P1,K4,MQUE            SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO MQUE
*
       ASSIGN     3,K19                 ASSIGN PROGRESS PARAMETER
*
       TRANSFER   ,DUTSC                TRANSFER ALL TO DUTSC
*
 MQUE  QUEUE      QATRN,3
 MLINK LINK       MCH,1PH               PLACE TRANSACTIONS ON A USER CHAIN
*                                       AWAITING ON-BASE TRANSPORTATION
```

```
**F WAREHOUSE AREA (F-8 - F-14)****************************************
 FWHEQ QUEUE      QFWHE,3
       TEST E     BV$LUNCH,K0,FWHEL     SEND ALL TO FWHEL DURING LUNCH,
*                                       ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,FWHET     SEND ALL TO NEXT BLOCK DURING
*                                       WORKING HOURS, ELSE SEND TO FWHET
       TEST E     R$FWHE,K0,FWHEE       SEND ALL TO FWHEE IF STORAGE IS
*                                       NOT FULL, ELSE NEXT BLOCK
 FWHEL LINK       FWHEC,1PH             LINK TO USER CHAIN FWHEC
 FWHET TEST GE    P1,K4,FWHEA           SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO FWHEA
       ASSIGN     3,K14                 ASSIGN PROGRESS PARAMETER
       DEPART     QFWHE,3               REMOVE FROM QFWHE
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 FWHEA ADVANCE    1                     DUMMY
       TRANSFER   ,FWHEL                SEND ALL TO FWHEL
 FWHEE ENTER      FWHE
       DEPART     QFWHE,3
 FWHE  ADVANCE    V$FWHES               PICK AND STAGE MATERIAL
       LEAVE      FWHE
       TEST E     BV$WORKH,K1,FWHT      DURING WORKING HOURS SEND ALL TO
*                                       NEXT BLOCK, ELSE TO FWHT
       UNLINK     FWHEC,FWHEE,1,BACK    RELEASE ONE TRANSACTION FROM FWHEC
*
 FWHT  TEST NE    P8,K1,DEEXQ           SEND WAREHOUSE REFUSALS TO
*                                       EXCEPTION HANDLING
*
       TEST E     BV$BEAR,K0,TERM       SEND BEARER ISSUES TO TERM, ALL
*                                       OTHERS TO NEXT BLOCK
*
       ASSIGN     4,FN$FNINE            ASSIGN ISSUE DESTINATION
*
       ASSIGN     5,V$FWHEW             ASSIGN ISSUE WEIGHT
*
       TEST G     V$TIME,1410,FQUE      IF LAST TRACTOR TRAIN OF DAY HAS
*                                       DEPARTED, SEND TO NEXT BLOCK, ELSE
*                                       FQUE
       TEST GE    P1,K4,FQUE            SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO FQUE
*
       ASSIGN     3,K20                 ASSIGN PROGRESS PARAMETER
*
       TRANSFER   ,DUTSC                TRANSFER ALL TO DUTSC
*
 FQUE  QUEUE      QATRN,3
 FLINK LINK       FCH,1PH               PLACE TRANSACTIONS ON A USER CHAIN
*                                       AWAITING ON-BASE TRANSPORTATION
```

```
**J WAREHOUSE AREA (J-11,J-12 AND GAS, LUMBER AND DRUM YARDS)************
 JWHEQ QUEUE      QJWHE,3
       TEST E     BV$LUNCH,K0,JWHEL     SEND ALL TO JWHEL DURING LUNCH,
*                                       ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,JWHET     SEND ALL TO NEXT BLOCK DURING
*                                       WORKING HOURS, ELSE SEND TO JWHET
       TEST E     R$JWHE,K0,JWHEE       SEND ALL TO JWHEE IF STORAGE IS
*                                       NOT FULL, ELSE NEXT BLOCK
 JWHEL LINK       JWHEC,1PH             LINK TO USER CHAIN JWHEC
 JWHET TEST GE    P1,K4,JWHEA           SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO JWHEA
       ASSIGN     3,K15                 ASSIGN PROGRESS PARAMETER
       DEPART     QJWHE,3               REMOVE FROM QJWHE
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 JWHEA ADVANCE    1                     DUMMY
       TRANSFER   ,JWHEL                SEND ALL TO JWHEL
 JWHEE ENTER      JWHE
       DEPART     QJWHE,3
 JWHE  ADVANCE    V$JWHES               PICK AND STAGE MATERIAL
       LEAVE      JWHE
       TEST E     BV$WORKH,K1,JWHT      DURING WORKING HOURS SEND ALL TO
*                                       NEXT BLOCK, ELSE TO JWHT
       UNLINK     JWHEC,JWHEE,1,BACK    RELEASE ONE TRANSACTION FROM JWHEC
*
 JWHT  TEST NE    P8,K1,DEEXQ           SEND WAREHOUSE REFUSALS TO
*                                       EXCEPTION HANDLING
*
       TEST E     BV$BEAR,K0,TERM       SEND BEARER ISSUES TO TERM, ALL
*                                       OTHERS TO NEXT BLOCK
*
       ASSIGN     4,FN$FTEN             ASSIGN ISSUE DESTINATION
*
       ASSIGN     5,V$JWHEW             ASSIGN ISSUE WEIGHT
*
       TEST G     V$TIME,1410,JQUE      IF LAST TRACTOR TRAIN OF DAY HAS
*                                       DEPARTED, SEND TO NEXT BLOCK, ELSE
*                                       JQUE
       TEST GE    P1,K4,JQUE            SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO JQUE
*
       ASSIGN     3,K21                 ASSIGN PROGRESS PARAMETER
*
       TRANSFER   ,DUTSC                TRANSFER ALL TO DUTSC
*
*
 JQUE  QUEUE      QBTRN,3
 JLINK LINK       JCH,1PH               PLACE TRANSACTIONS ON A USER CHAIN
*                                       AWAITING ON-BASE TRANSPORTATION
```

```
*************************************************************************
**          PROVISIONS TRACTOR TRAIN DELIVERY                          **
** IN ACTUAL NSD YOKOSUKA OPERATIONS, SPECIAL TRACTOR TRAIN RUNS       **
** ARE SCHEDULED TO MEET OPERATIONAL REQUIREMENTS OF THE               **
** REQUISITIONER. THESE SPECIAL RUNS ARE TYPICALLY SCHEDULED AFTER     **
** NORMALLY SCHEDULED RUNS ARE COMPLETED. THOUGH THE SCHEDULE IS NOT   **
** FIXED, IN THE INTEREST OF MAINTAINING ACCURATE THROUGHPUT STATS,    **
** A PROVISIONS TRACTOR TRAIN IS SCHEDULED FOR 1600 EACH DAY, WITH     **
** A SECOND RUN AT USER DISCRETION. ALL HIGH PRIORITY ISSUES THAT      **
** ARRIVE AFTER 1530 ARE ROUTED TO THE DUTY SECTION MODULE. THE        **
** PROVISIONS TRACTOR TRAIN SCHEDULE CONTROL SECTION IS PARTIONED      **
** AT THE TOP OF THE MODULE.                                           **
*************************************************************************
*
**SCHEDULE CONTROL SECTION*************************************************
       GENERATE   2400,,1600          GENERATE CONTROL TRANSACTION
*                                     REPRESENTING DAILY TRACTOR
*                                     TRAIN FOR PROVISIONS AT 1600
       TEST NE    BV$WKDAY,K1,SPLTP   SEND TRAIN TO SPLTP IF WORKDAY,
*                                     ELSE NEXT BLOCK
       TERMINATE      .               TERMINATE CONTROL TRANSACTION
 SPLTP SPLIT      1,LOADP             SPLIT CONTROL TRANSACTION, SEND
*                                     ONE COPY TO NEXT BLOCK AND ONE TO
*                                     LOADP
       ADVANCE    10                  DUMMY ADVANCE TO SEPARATE TRAINS
       TEST L     V$PWGHT,V$PXTRA,LOADP
*                                     IF THE ESTIMATED WEIGHT OF
*                                     ISSUES WAITING FOR THE PTRN
*                                     EXCEEDS PXTRA, SEND TO LOADP,
*                                     ELSE NEXT BLOCK
       TERMINATE                      TERMINATE CONTROL TRANSACTION
*
 LOADP UNLINK     PTRNC,PTRNT,ALL,BACK UNLINK ALL TRANSACTIONS FROM PTRNC
*                                     TO PTRNT
       SAVEVALUE  PNUM+,1,XF          COUNT PTRN RUNS
       TERMINATE                      TERMINATE CONTROL TRANSACTION
**OPERATIONS SECTION*******************************************************
*
 PTRNQ TEST G     V$TIME,1610,PQUE    IF LAST TRACTOR TRAIN OF DAY HAS
*                                     DEPARTED, SEND TO NEXT BLOCK, ELSE
*                                     PQUE
       TEST GE    P1,K4,PQUE          SEND HI PRI REQS TO NEXT BLOCK,
*                                     ALL OTHERS TO PQUE
*
       ASSIGN     3,K16               ASSIGN PROGRESS PARAMETER
*
       TRANSFER   ,DUTSC              TRANSFER ALL TO DUTSC
*
 PQUE  QUEUE      QPTRN,3
 PLINK LINK       PTRNC,1PH           PLACE TRANSACTIONS ON A USER CHAIN
*                                     AWAITING ON-BASE TRANSPORTATION
 PTRNT TEST L     R$PTRN,P5,PTRNE     IF THERE IS SUFFICIENT REMAINING
*                                     CAPACITY IN PTRN SEND TO PTRNE,
*                                     ELSE NEXT BLOCK
       TEST LE    P1,K3,PTRNE         SEND HI PRI ISSUES TO PTRNE, ALL
*                                     OTHERS TO NEXT BLOCK
       ADVANCE    1                   DUMMY ADVANCE
       TRANSFER   ,PLINK              TRANSFER ALL BACK TO PLINK
 PTRNE ENTER      PTRN,PH5
       DEPART     QPTRN,3
       ADVANCE    8                   TRANSPORTATION DELAY TO J-39
       LEAVE      PTRN,PH5
       TRANSFER   ,FRTTE              TRANSFER ALL TO FRTTE
```

```
**********************************************************************
**                    TRACTOR TRAIN DELIVERY                        **
** CONTROL TRANSACTIONS REPRESENTING NSD-OPERATED TRACTOR TRAINS     **
** ARE GENERATED AT 0815,1015,1300,1400. ON WORKDAYS, THE            **
** TRANSACTIONS ARE ROUTED TO UNLINK MATERIAL TRANSACTIONS WAITING   **
** ON THE VARIOUS WAREHOUSE USER CHAINS. MATERIAL TRANSACTIONS ARE   **
** LINKED TO THE ATRNC OR BTRNC, AS APPROPRIATE, TO THE CAPACITY OF  **
** THE RESPECTIVE TRAINS REMAINING AT EACH STOP. TRANSACTIONS ARE    **
** THEN UNLINKED AND MATERIAL REQUISITIONED BY SRF OR PWC IS SENT TO**
** TERMINATION TO SIMULATE DELIVERY. ALL OTHER ISSUES ARE UNLINKED   **
** TO THE FREIGHT TERMINAL MODULE. HIGH PRIORITY TRANSACTIONS THAT   **
** MISS THE LAST SCHEDULED TRAIN ARE SENT TO THE DUTY SECTION        **
** MODULE. AT USER DISCRETION, AN ADDITIONAL TRAIN MAY BE RUN ON     **
** EACH ROUTE AT 1500 TO REDUCE BACKLOG. THE TRACTOR TRAIN SCHEDULE  **
** CONTROL SECTION IS PARTIONED AT THE TOP OF THE MODULE.            **
**********************************************************************
*
**SCHEDULE CONTROL SECTION*****************************************
*
       GENERATE   2400,,825             GENERATE CONTROL TRANSACTION
*                                       REPRESENTING 0815 TRAINS
       TRANSFER   ,TRAIN                SEND TO WAREHOUSES ON ROUTE
*
       GENERATE   2400,,1025            GENERATE CONTROL TRANSACTION
*                                       REPRESENTING 1015 TRAINS
       TRANSFER   ,TRAIN                SEND TO WAREHOUSES ON ROUTE
*
       GENERATE   2400,,1300            GENERATE CONTROL TRANSACTION
*                                       REPRESENTING 1300 TRAINS
       TRANSFER   ,TRAIN                SEND TO WAREHOUSES ON ROUTE
*
       GENERATE   2400,,1400            GENERATE CONTROL TRANSACTION
*                                       REPRESENTING 1400 TRAINS
       TRANSFER   ,TRAIN                SEND TO WAREHOUSES ON ROUTE
*
       GENERATE   2400,,1500            GENERATE CONTROL TRANSACTION
*                                       REPRESENTING 1500 TRAINS
       TEST E     BV$WKDAY,K1,TTTRM     ON WORKDAYS, SEND TO NEXT BLOCK
       SPLIT      1,LATEB               SPLIT CONTROL TRANSACTION
       TEST L     V$AWGHT,V$AXTRA,LOADA
*                                       IF THE ESTIMATED WEIGHT OF
*                                       ISSUES WAITING FOR THE ATRN
*                                       EXCEEDS AXTRA, SEND TO LOADA,
*                                       ELSE NEXT BLOCK
       TERMINATE                        TERMINATE CONTROL TRANSACTION
*
 LATEB TEST L     V$BWGHT,V$BXTRA,LOADB
*                                       IF THE ESTIMATED WEIGHT OF
*                                       ISSUES WAITING FOR THE BTRN
*                                       EXCEEDS BXTRA, SEND TO LOADB,
*                                       ELSE NEXT BLOCK
       TERMINATE                        TERMINATE CONTROL TRANSACTION
*
 TRAIN TEST NE    BV$WKDAY,K1,LOAD      SEND TRAIN TO LOAD IF WORKDAY
 TTTRM TERMINATE                        TERMINATE CONTROL TRANSACTION
*
 LOAD  SPLIT      1,LOADB               SPLIT CONTROL TRANSACTION, SEND
*                                       ONE COPY TO NEXT BLOCK AND ONE TO
*                                       LOADB
```

```
**LOADING SECTION ***************************************************
*
 LOADA UNLINK      MCH,ATEST,ALL,BACK    UNLINK ALL TRANSACTIONS FROM MCH
*                                        TO ATRNT
       UNLINK      FCH,ATEST,ALL,BACK    UNLINK ALL TRANSACTIONS FROM FCH
*                                        TO ATRNT
       ADVANCE     17                    SIMULATE TRANSPORTATION TIME TO
*                                        F WAREHOUSE AREA
       UNLINK      MCH,ATRNT,ALL,BACK    UNLINK ALL TRANSACTIONS FROM MCH
*                                        TO ATRNT
       UNLINK      FCH,ATRNT,ALL,BACK    UNLINK ALL TRANSACTIONS FROM FCH
*                                        TO ATRNT
       ADVANCE     32                    SIMULATE TRANSPORTATION TIME TO
*                                        PWC/SRF
       UNLINK      ATRNC,ATRNL,ALL,BACK  UNLINK ALL TRANSACTIONS FROM ATRNC
*                                        TO ATRNL
       SAVEVALUE   ANUM+,1,XF            COUNT ATRN RUNS
       TERMINATE                         TERMINATE CONTROL TRANSACTION
*
 LOADB UNLINK      JCH,BTEST,ALL,BACK    UNLINK ALL TRANSACTIONS FROM JCH
*                                        TO BTEST
       UNLINK      BCH,BTEST,ALL,BACK    UNLINK ALL TRANSACTIONS FROM BCH
*                                        TO BTEST
       UNLINK      ACH,BTEST,ALL,BACK    UNLINK ALL TRANSACTIONS FROM ACH
*                                        TO BTEST
       ADVANCE     8                     SIMULATE TRANSPORTATION TIME TO
*                                        J WAREHOUSE AREA
       UNLINK      JCH,BTRNT,ALL,BACK    UNLINK ALL TRANSACTIONS FROM JCH
*                                        TO BTRNT
       ADVANCE     3                     SIMULATE TRANSPORTATION TIME TO
*                                        B WAREHOUSE AREA
       UNLINK      BCH,BTRNT,ALL,BACK    UNLINK ALL TRANSACTIONS FROM BCH
*                                        TO BTRNT
       ADVANCE     10                    SIMULATE TRANSPORTATION TIME TO
*                                        A WAREHOUSE AREA
       UNLINK      ACH,BTRNT,ALL,BACK    UNLINK ALL TRANSACTIONS FROM ACH
*                                        TO BTRNT
       ADVANCE     17                    SIMULATE TRANSPORTATION TIME TO
*                                        PWC/SRF
       UNLINK      BTRNC,BTRNL,ALL,BACK  UNLINK ALL TRANSACTIONS FROM BTRNC
*                                        TO BTRNL
       SAVEVALUE   BNUM+,1,XF            COUNT BTRN RUNS
       TERMINATE                         TERMINATE CONTROL TRANSACTION
```

```
**OPERATIONS SECTION - A TRAIN ROUTE**********************************
*
 ATEST TEST G     P1,K1,ASEND           SEND IPG3 ISSUES TO ASEND, ALL
*                                       OTHERS TO NEXT BLOCK
 ATRNT TEST L     R$ATRN,P5,ATRNE       IF THERE IS SUFFICIENT REMAINING
*                                       CAPACITY IN ATRN SEND TO ATRNE,
*                                       ELSE NEXT BLOCK
 ASEND ADVANCE    1                     DUMMY ADVANCE
       TRANSFER   FN,FTHFR              TRANSFER ALL BACK TO WAREHOUSE
 ATRNE ENTER      ATRN,PH5
       DEPART     QATRN,3
       LINK       ATRNC,1PH             LINK TO ATRNC
 ATRNL LEAVE      ATRN,PH5
       TRANSFER   ,TMTST                TRANSFER ALL TO TMTST
*
**OPERATIONS SECTION - B TRAIN ROUTE**********************************
*
 BTEST TEST G     P1,K1,BSEND           SEND IPG3 ISSUES TO BSEND, ALL
*                                       OTHERS TO NEXT BLOCK
 BTRNT TEST L     R$BTRN,P5,BTRNE       IF THERE IS SUFFICIENT REMAINING
*                                       CAPACITY IN BTRN SEND TO BTRNE,
*                                       ELSE NEXT BLOCK
 BSEND ADVANCE    1                     DUMMY ADVANCE
       TRANSFER   FN,FTHFV              TRANSFER ALL BACK TO WAREHOUSE
 BTRNE ENTER      BTRN,PH5
       DEPART     QBTRN,3
       LINK       BTRNC,1PH             LINK TO BTRNC
 BTRNL LEAVE      BTRN,PH5
*
**TEST FOR PWC/PRF DELIVERY*******************************************
*
 TMTST TEST NE    P4,K1,TERM            SEND ISSUES FOR SRF AND PWC TO
*                                       TERM TO SIMULATE DELIVERY BY
*                                       TRACTOR TRAIN, ALL OTHERS TO NEXT
       ADVANCE    17                    SIMULATE TRANSPORTATION TIME TO
*                                       FREIGHT TERMINAL
```

```
*************************************************************************
**                    FREIGHT TERMINAL MODULE                          **
** TRANSACTIONS REPRESENTING MATERIAL ARE TESTED FOR PACK TYPE         **
** REQUIRED AND SENT TO LIGHT OR HEAVY PACK LINES AS APPROPRIATE       **
** (PARCEL POST PACKS GO TO THE LIGHT PACK LINE). PACK TIMES           **
** IN THE LIGHT PACK LINE ARE OBTAINED FROM FUNCTION FTWSV. AFTER      **
** PACKING IS COMPLETED, ALL ISSUES ARE ROUTED TO THE TERMINATION      **
** MODULE AS AVAILABLE FOR SHIPMENT. MATERIAL RECEIVED FROM TRACTOR    **
** TRAINS THAT DOES NOT REQUIRE PACKING IS SENT DIRECTLY TO THE        **
** TERMINATION MODULE AS AVAILABLE FOR SHIPMENT.                       **
*************************************************************************
*
*************************************************************************
*
 FRTTE TEST E     P4,K2,TERM           SEND ISSUES AVAILABLE FOR SHIPMENT
*                                      SHIPMENT TO TERM, ALL OTHERS TO
*                                      NEXT BLOCK
*
       TRANSFER   .V$LITEP,,LITPQ      TRANSFER ISSUES REQUIRING LIGHT OR
*                                      PARCEL POST PACK TO LITEQ, ALL
*                                      OTHERS TO NEXT BLOCK
*
**HEAVY PACK OPERATIONS SECTION*****************************************
*
 HVYPQ QUEUE      QHVYP,3
       TEST E     BV$LUNCH,K0,HVYPL    SEND ALL TO HVYPL DURING LUNCH,
*                                      ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,HVYPT    SEND ALL TO NEXT BLOCK DURING
*                                      WORKING HOURS, ELSE SEND TO HVYPT
       TEST E     R$HVYP,K0,HVYPE      SEND ALL TO HVYPE IF STORAGE IS
*                                      NOT FULL, ELSE NEXT BLOCK
 HVYPL LINK       HVYPC,1PH            LINK TO USER CHAIN HVYPC
 HVYPT TEST GE    P1,K4,HVYPA          SEND HI PRI REQS TO NEXT BLOCK,
*                                      ALL OTHERS TO HVYPA
       ASSIGN     3,K22                ASSIGN PROGRESS PARAMETER
       DEPART     QHVYP,3              REMOVE FROM QHVYP
       TRANSFER   ,DUTSC               SEND HI PRI REQS TO DUTSC
 HVYPA ADVANCE    1                    DUMMY
       TRANSFER   ,HVYPL               SEND ALL TO HVYPL
 HVYPE ENTER      HVYP
       DEPART     QHVYP,3
 HVYP  ADVANCE    V$HVYPS              PACK MATERIAL REQUIRING HEAVY PACK
       LEAVE      HVYP
       TEST E     BV$WORKH,K1,HVYTR    DURING WORKING HOURS SEND ALL TO
*                                      NEXT BLOCK, ELSE TO HVYTR
       UNLINK     HVYPC,HVYPE,1,BACK   RELEASE ONE TRANSACTION FROM HVYPC
 HVYTR TRANSFER   ,TERM
```

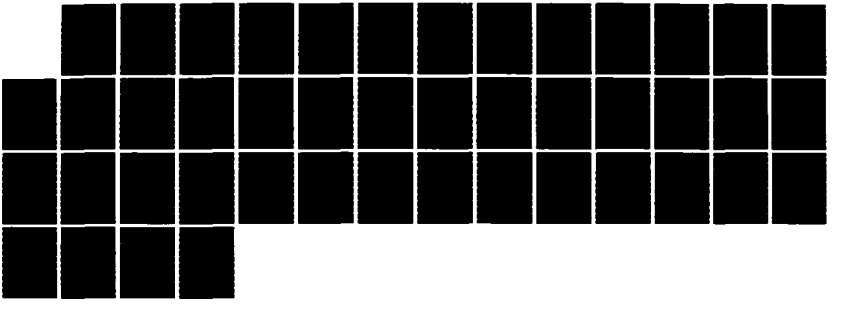
```
**LIGHT AND PARCEL POST PACK OPERATIONS SECTION**********************
*
 LITPQ QUEUE      QLITP,3
       TEST E     BV$LUNCH,K0,LITPL     SEND ALL TO LITPL DURING LUNCH,
*                                       ELSE NEXT BLOCK
       TEST E     BV$WORKH,K1,LITPT     SEND ALL TO NEXT BLOCK DURING
*                                       WORKING HOURS, ELSE SEND TO LITPT
       TEST E     R$LITP,K0,LITPE       SEND ALL TO LITPE IF STORAGE IS
*                                       NOT FULL, ELSE NEXT BLOCK
 LITPL LINK       LITPC,1PH             LINK TO USER CHAIN LITPC
 LITPT TEST GE    P1,K4,LITPA           SEND HI PRI REQS TO NEXT BLOCK,
*                                       ALL OTHERS TO LITPA
       ASSIGN     3,K23                 ASSIGN PROGRESS PARAMETER
       DEPART     QLITP,3               REMOVE FROM QLITP
       TRANSFER   ,DUTSC                SEND HI PRI REQS TO DUTSC
 LITPA ADVANCE    1                     DUMMY
       TRANSFER   ,LITPL                SEND ALL TO LITPL
 LITPE ENTER      LITP
       DEPART     QLITP,3
 LITP  ADVANCE    V$LITPS               PACK MATERIAL REQUIRING LIGHT OR
*                                       PARCEL POST PACK
       LEAVE      LITP
       TEST E     BV$WORKH,K1,LITTR     DURING WORKING HOURS SEND ALL TO
*                                       NEXT BLOCK, ELSE TO LITTR
       UNLINK     LITPC,LITPE,1,BACK    RELEASE ONE TRANSACTION FROM LITPC
 LITTR TRANSFER   ,TERM
```

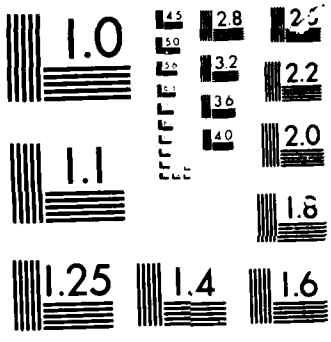
```
*************************************************************************
**                        DUTY SECTION                                 **
** THE SCHEDULE CONTROL SECTION GENERATES A CONTROL TRANSACTION AT     **
** AT THE START OF EACH DAY TO CONTROL DUTY SECTION OPERATIONS. ON     **
** WORKDAYS, ADVANCE BLOCKS MOVE THE TRANSACTION THRU THE SCHEDULE     **
** CONTROL SECTION. AT APPROPRIATE TIMES, THE STORAGE REPRESENTING     **
** THE DUTY SECTION IS OPENED AND CLOSED AND TRANSACTIONS ARE LINKED**
** TO AND UNLINKED FROM USER CHAINS WITHIN THE OPERATING SECTION.      **
*************************************************************************
** THE DUTY SECTION OPERATIONS SECTION SIMULATES NSD LATE SHIFT AND   **
** DUTY SECTION OPERATIONS. THE DUTY STORAGE HAS A CAPACITY OF TWO     **
** MATCHING THE NUMBER OF PERSONNEL ACTUALLY AVAILABLE IN BOTH THE     **
** LATE SHIFT AND THE DUTY SECTION TO PROCESS ISSUES. TRANSACTIONS     **
** ENTERING THE MODULE ARE SPLIT INTO THREE TRANSACTIONS TO RESTORE   **
** THE ACTUAL DEMAND LEVEL AND ADVANCED TO THE POINT OF PROGRESS       **
** INDICATED BY P3. TRANSACTIONS TRANSFERRED TO THE DUTY SECTION       **
** BUT NOT PROCESSED ARE TRANSFERRED BACK TO THEIR MODULE OF ORIGIN.**
** COMPLETED ISSUES ARE TERMINATED AS APPROPRIATE (NIS OR AVAILABLE   **
** FOR SHIPMENT). NOTE: BECAUSE MOST HIGH PRIORITY PERISHABLE          **
** PROVISIONS ISSUES MADE OUTSIDE OF NORMAL WORKING HOURS BY NSD       **
** ARE FOR FLEET ACTIVITIES, YOKOHAMA COLD STORAGE REQUISITIONS ARE   **
** ROUTED INSTEAD TO YOKOSUKA COLD STORAGE.                            **
*************************************************************************
*
**SCHEDULE CONTROL SECTION*************************************************
*
        GENERATE    2400,0,1                GENERATE CONTROL TRANSACTION
*
        TEST E      BV$WKDAY,K1,DTEND       SEND TO DTEND IF SAT/SUN ELSE NEXT
*                                            BLOCK
        ADVANCE     800                     ADVANCE TO 0801
        UNLINK      DUTYC,DUTYD,ALL,BACK    UNLINK TRANSACTIONS NOT PROCESSED
*                                            BY THE DUTY SECTION
        ADVANCE     875                     ADVANCE TO 1646
        UNLINK      DUTYC,DUTYS,2,BACK      UNLINK 2 TRANSACTIONS FOR DUTY
*                                            SECTION PROCESSING
 DTEND  TERMINATE                           TERMINATE CONTROL TRANSACTION
```

```
 PTWTH ADVANCE     FN$FTWSV                LIGHT/PARCEL POST PACK
 SHIP  ASSIGN      3,K24                   TAG AS AVAILABLE FOR SHIPMENT
       LEAVE       DUTY
 DUTTR ADVANCE                             DUMMY ADVANCE
       TEST E      BV$THREE,K1,SEND
       UNLINK      DUTYC,DUTYS,1,BACK
*                                          UNLINK ONE TRANSACTION FROM DUTYC
*                                          FOR EVERY THREE LEAVING
 SEND  TRANSFER    FN,FTHIR                SEND ISSUES TO LOCATION DETERMINED
*                                          BY PROGRESS PARAMETER
```

AD-A168 514 A SIMULATION MODEL OF ISSUE PROCESSING AT NAVAL SUPPLY DEPOT YOKOSUKA JAPAN(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA M S CLIFT MAR 86 2/2

UNCLASSIFIED F/G 15/5 NL




1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.2
2.0
1.8

```
**OPERATIONS SECTION**************************************************
*
 DUTSC QUEUE       DUTYQ
       TEST NE     BV$OPEN,K1,DUTYL      IF OUTSIDE WORKING HOURS, SEND
*                                        TO NEXT BLOCK, ELSE DUTYL
       TEST E      R$DUTY,K0,DUTYS       IF DUTY STORAGE IS NOT FULL, SEND
*                                        TO DUTYS, ELSE NEXT BLOCK
 DUTYL LINK        DUTYC,1PH             LINK TO USER CHAIN DUTYC
 DUTYD DEPART      DUTYQ
       TRANSFER    FN,FTHIR              TRANSFER ALL TRANSACTIONS NOT
*                                        PROCESSED BY THE DUTY SECTION BACK
*                                        TO THE POINT OF PROGRESS INDICATED
*                                        BY P3
 DUTYS SPLIT       2,QSPLT               SPLIT EACH TRANSACTION INTO THREE
       TRANSFER    ,DUTYE                TRANSFER ALL TO DUTYE
 QSPLT QUEUE       DUTYQ                 ADD SPLIT TRANSACTIONS TO QUEUE
 DUTYE ENTER       DUTY
       DEPART      DUTYQ
       TRANSFER    FN,FTHON              TRANSFER ALL TRANSACTIONS TO BE
*                                        WORKED BY THE DUTY SECTION TO
*                                        THE POINT OF PROGRESS INDICATED BY
*                                        P3
*
 PZERO ADVANCE     FN$FELEV              STOCK CHECK ALL REQUISITIONS
       TRANSFER    .V$GROSS,,RTE         TRANSFER IN STOCK REQS TO RTE,
*                                        NIS REQS TO NEXT BLOCK
       ASSIGN      3,K2                  TAG NIS REQS
       LEAVE       DUTY
       TRANSFER    ,DUTTR
 PONE  TEST NE     P6,K2,RTE             SEND IN STOCK REQS TO RTE, ALL
*                                        OTHERS TO NEXT BLOCK
       ADVANCE     FN$FELEV              PERFORM STOCK CHECK
       TEST E      P6,K1,RTE             SEND NIS REQS TO NEXT BLOCK, ALL
*                                        OTHERS TO NEXT BLOCK
       ASSIGN      3,K2                  TAG NIS REQS
       LEAVE       DUTY
       TRANSFER    ,DUTTR
 RTE   ADVANCE     FN$FTWEL              REMOTE TERMINAL ENTRY OF REQS
       TRANSFER    .V$NOTEX,,WHEAS       SEND DEMAND EXCEPTIONS TO NEXT
*                                        BLOCK, ALL OTHERS TO WHEAS
 PTHRE ADVANCE     FN$FFRTN              PROCESS DEMAND EXCEPTIONS
 WHEAS ASSIGN      2,FN$FTWO             ASSIGN WAREHOUSE LOCATION
 WRTR  TRANSFER    .V$NOTWR,,PFOUR       SEND WAREHOUSE REFUSALS TO NEXT
*                                        BLOCK, ALL OTHERS TO PFOUR
       ASSIGN      8,K1                  TAG WAREHOUSE REFUSALS
 PFOUR TEST E      P2,K1,SORT            SEND YOKOHAMA ISSUE DOCS TO NEXT
*                                        BLOCK, ALL OTHERS TO SORT
       ASSIGN      2,K2                  REASSIGN YOKOHAMA REQS TO YOKOSUKA
*                                        COLD STORAGE
 SORT  ADVANCE     FN$FSXTN              MARK,BURST ISSUE DOCS
 PSIX  ADVANCE     FN$FTHSV              DRIVE TO WAREHOUSE LOCATION
 PEIGH ADVANCE     FN$FSVTN              MAKE PICK
       TEST E      P8,K1,TURN            SEND WAREHOUSE REFUSALS TO NEXT
*                                        BLOCK, ALL OTHERS TO TURN
       ASSIGN      3,K25                 TAG WAREHOUSE REFUSALS
       LEAVE       DUTY
       TRANSFER    ,DUTTR
 TURN  TEST E      BV$BEAR,K1,DESTA      SEND BEARER ISSUES TO NEXT BLOCK,
*                                        ALL OTHERS TO DESTA
       ASSIGN      3,K24                 TAG BWT ISSUES
       LEAVE       DUTY
       TRANSFER    ,DUTTR
 DESTA ASSIGN      4,FN$FTHRE            ASSIGN ISSUE DESTINATION TO P4
 PSXTN ADVANCE     FN$FTHEI              DRIVE TO FREIGHT TERMINAL
       TEST E      P4,K2,SHIP            SEND ISSUES REQUIRING PACKING TO
*                                        NEXT BLOCK, ALL OTHERS TO SHIP
       TRANSFER    .V$LITEP,,PTWTH       SEND ISSUES REQUIRING HEAVY PACK
*                                        TO NEXT BLOCK, ALL OTHERS TO PTWTH
 PTWTW ADVANCE     FN$FTWSX              HEAVY PACK
       TRANSFER    ,SHIP                 SEND ALL TO SHIP
```

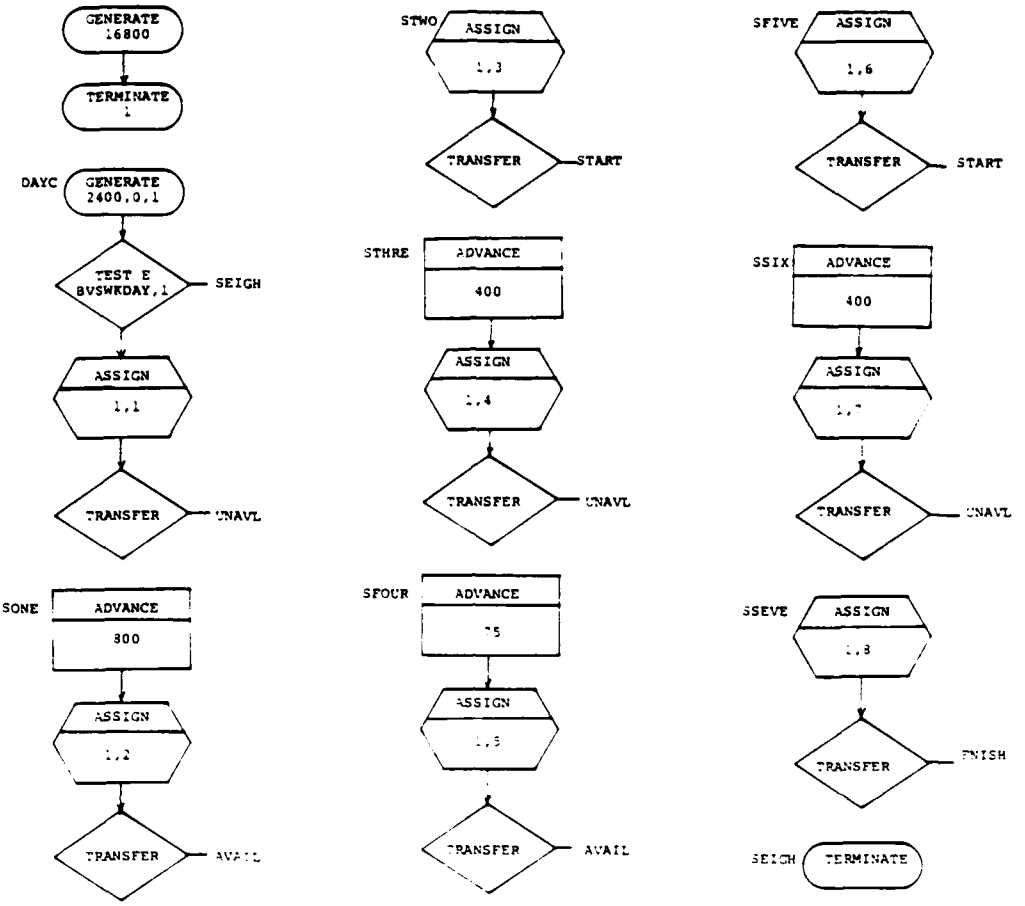
```
*************************************************************************
**                    TERMINATION MODULE                               **
** IN THE TABLE DEFINITION SECTION, FREQUENCY DISTRIBUTION TABLES      **
** ARE DEFINED TO MEASURE THROUGHPUT TIME FOR ALL ISSUES (ALL) AND     **
** BY ISSUE PRIORITY GROUP (IPGON,IPGTW,IPGTH). TABULATION OF          **
** ISSUES IN APPROPRIATE TABLES IS MANAGED BY ROUTING TRANSACTIONS     **
** BY PARAMETER ONE VALUES. RAW COUNTS ARE MADE ON NIS AND             **
** WAREHOUSE REFUSAL TRANSACTIONS.                                     **
*************************************************************************
*
**TABLE DEFINITIONS*****************************************************
*
 ALL   TABLE      M1,0,1200,22
 IPGON TABLE      M1,0,1200,16
 IPGTW TABLE      M1,0,1200,16
 IPGTH TABLE      M1,0,1200,22
*
**ISSUE COUNT, TABULATION AND TERMINATION*****************************
*
 TERM  SPLIT      2,ALLCT              SPLIT EACH TRANSACTION INTO 3 TO
*                                      RESTORE DEMAND LEVEL
 ALLCT TABULATE   ALL                  ENTER ALL ISSUES INTO TABLE ALL
       TEST NE    P1,K1,TMTHR          SEND IPG3 TRANSACTIONS TO TMTHR,
*                                      ALL OTHERS TO NEXT BLOCK
       TEST G     P1,K5,TMTWO          SEND IPG2 TRANSACTIONS TO TMTWO,
*                                      ALL OTHERS TO NEXT BLOCK
 TMONE TABULATE   IPGON                ENTER IPG1 TRANSACTIONS INTO
*                                      TABLE IPGON
       TERMINATE                       TERMINATE IPG1 TRANSACTIONS
 TMTWO TABULATE   IPGTW                ENTER IPG2 TRANSACTIONS INTO
*                                      TABLE IPGTW
       TERMINATE                       TERMINATE IPG2 TRANSACTIONS
 TMTHR TABULATE   IPGTH                ENTER IPG3 TRANSACTIONS INTO
*                                      TABLE IPGTH
       TERMINATE                       TERMINATE IPG3 TRANSACTIONS
*
 NISTM SPLIT      2,DTNIS
 DTNIS SAVEVALUE  NISCT+,1,XF          COUNT NIS REQS
       TERMINATE                       TERMINATE NIS REQS
*
 WRTRM SPLIT      2,DTWR
 DTWR  SAVEVALUE  WRCT+,1,XF           COUNT WAREHOUSE REFUSALS
       TERMINATE                       TERMINATE WAREHOUSE REFUSALS
```

```
*************************************************************************
**                    SIMULATION RUN CONTROL                           **
** THE FIRST START STATEMENT AND THE FOLLOWING RESET STATEMENT ARE     **
** USED TO BRING THE MODEL TO STEADY STATE, THAT IS, TO FILL IT        **
** WITH TRANSACTIONS SO THAT THE SIMULATION DOES NOT START WITH AN     **
** EMPTY SUPPLY DEPOT. THE INITIAL STATEMENT RESETS ALL SAVEVALUES     **
** USED TO GATHER STATISTICS DURING THE SIMULATION TO ZERO. THE        **
** FINAL START STATEMENT REFERS TO FIRST TERMINATE STATEMENT IN THE    **
** MASTER SCHEDULE CONTROL MODULE, TERMINATING THE SIMULATION WHEN     **
** THE 4TH TRANSACTIONS ENTERS THAT BLOCK.                             **
*************************************************************************
*
       START      2,NP
       RESET
       INITIAL    XF$REQCT,0/XF$PRION,0/XF$PRITW,0/XF$PRITH,0
       INITIAL    XF$ANUM,0/XF$BNUM,0/XF$PNUM,0
       INITIAL    XF$NISCT,0/XF$WRCT,0
       START      4,,1
       END
//
```

APPENDIX B

GPSS BLOCK DIAGRAM

TABLE OF CONTENTS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1
DAYC
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2400,0,1
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TRANSFER
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SONE
ADVANCE
800
ASSIGN
1,2
TRANSFER
AVAIL
STWO
ASSIGN
1,3
TRANSFER
START
STHRE
ADVANCE
400
ASSIGN
1,4
TRANSFER
UNAVL
SFOUR
ADVANCE
ASSIGN
TRANSFER
AVAIL
SFIVE
ASSIGN
1,6
TRANSFER
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ASSIGN
TRANSFER
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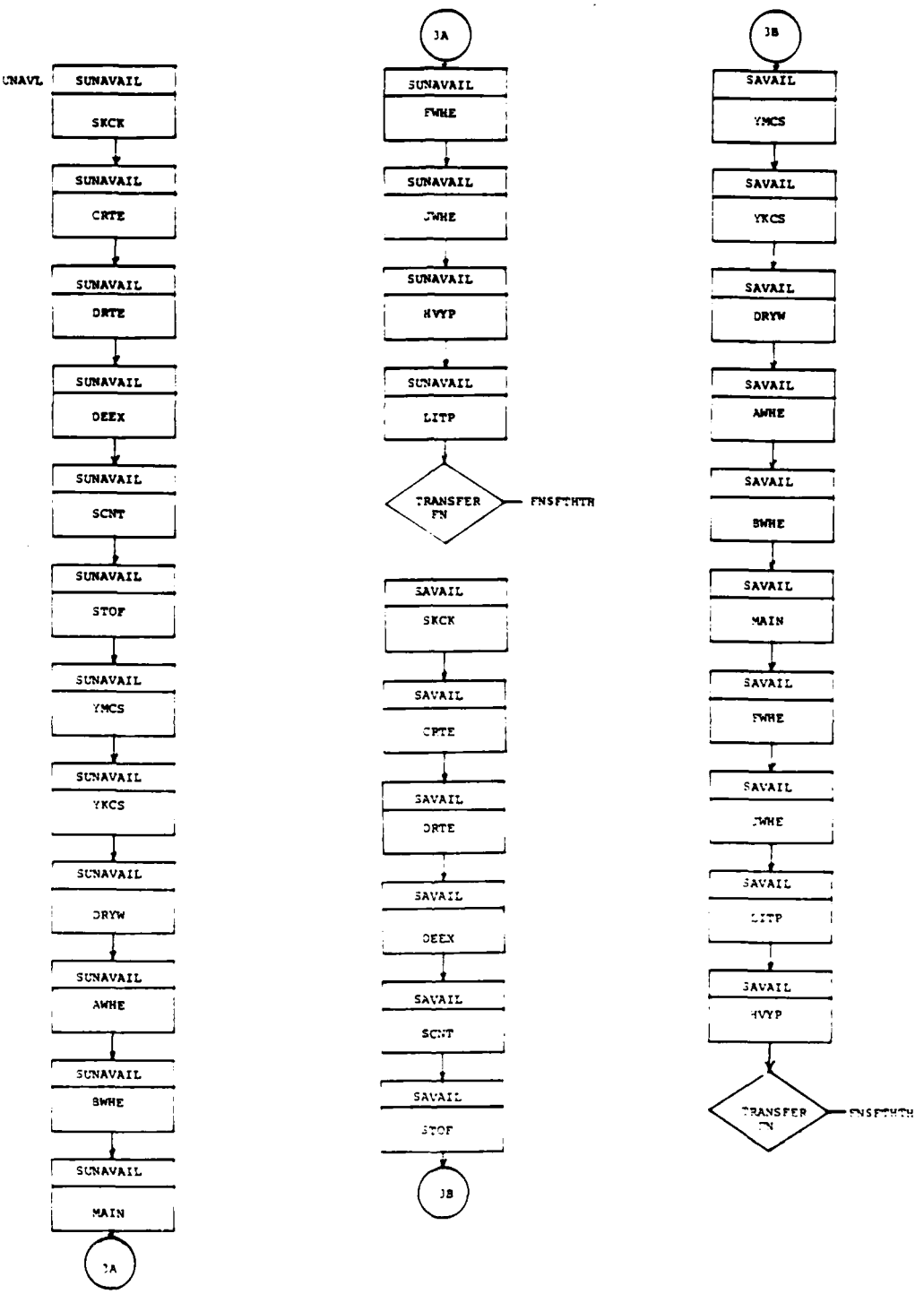
SSEVE
ASSIGN
1,8
TRANSFER
FNISH
SEIGH
TERMINATE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SKCK
SUNAVAIL
CRTE
SUNAVAIL
DRTE
SUNAVAIL
DEEX
SUNAVAIL
SCNT
SUNAVAIL
STOF
SUNAVAIL
YMCS
SUNAVAIL
YKCS
SUNAVAIL
DRYW
SUNAVAIL
AWHE
SUNAVAIL
BWHE
SUNAVAIL
MAIN
JA
JA
SUNAVAIL
FWHE
SUNAVAIL
JWHE
SUNAVAIL
HVYP
SUNAVAIL
LITP
TRANSFER FN
FNSFTHTH
SAVAIL
SKCK
SAVAIL
CRTE
SAVAIL
DRTE
SAVAIL
DEEX
SAVAIL
SCNT
SAVAIL
STOF
JB
JB
SAVAIL
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YKCS
SAVAIL
DRYW
SAVAIL
AWHE
SAVAIL
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SAVAIL
LITP
SAVAIL
HVYP
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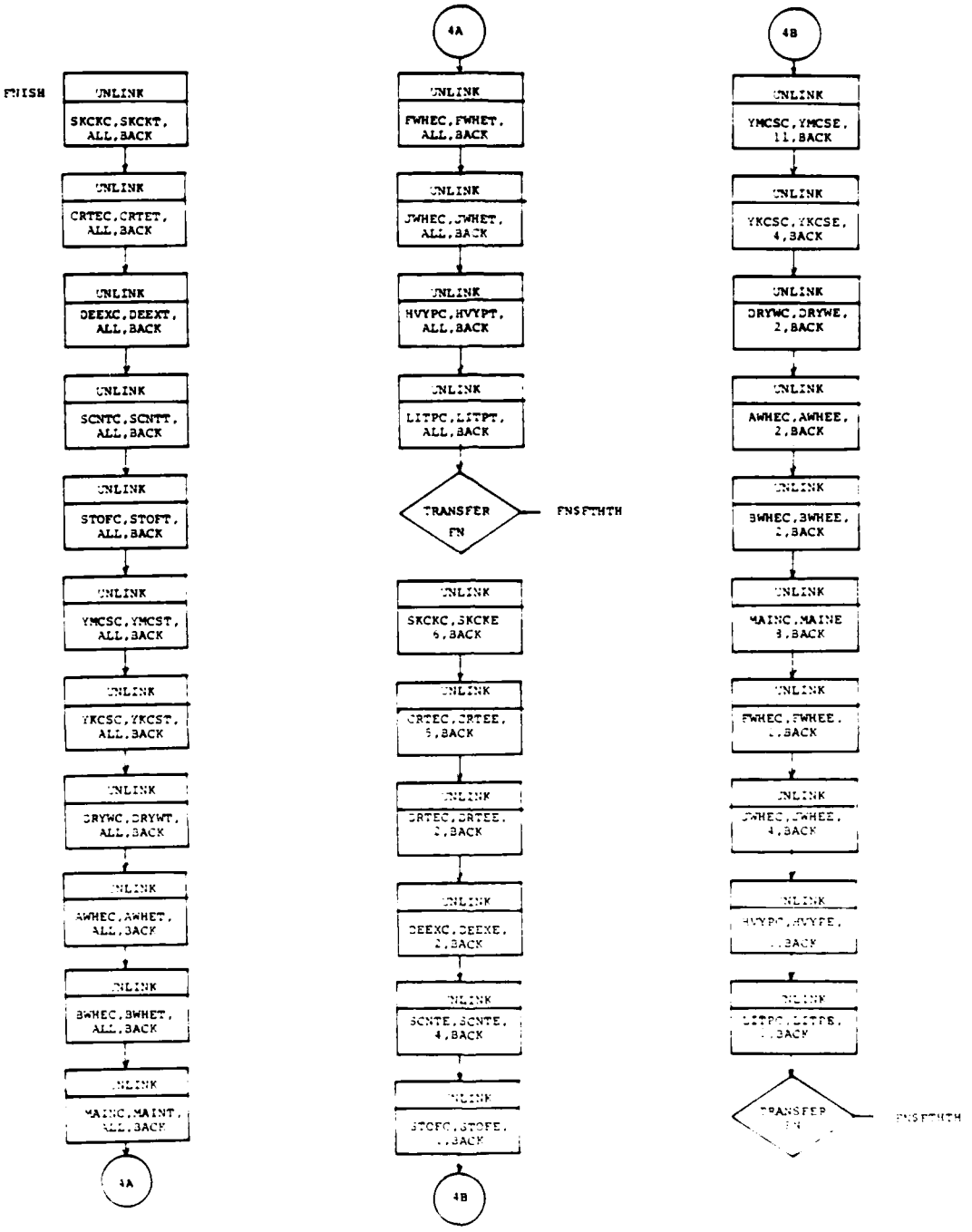
FNSFTHTH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ALL,BACK
UNLINK
CRTEC,CRTET,
ALL,BACK
UNLINK
DEEXC,DEEXT,
ALL,BACK
UNLINK
SCNTC,SCNTT,
ALL,BACK
UNLINK
STOFC,STOFT,
ALL,BACK
UNLINK
YMCSC,YMCST,
ALL,BACK
UNLINK
YKCSC,YKCST,
ALL,BACK
UNLINK
DRYWC,DRYWT,
ALL,BACK
UNLINK
AWHEC,AWHET,
ALL,BACK
UNLINK
BWHEC,BWHET,
ALL,BACK
UNLINK
MAINC,MAINT,
ALL,BACK
4A
4A
UNLINK
FWHEC,FWHET,
ALL,BACK
UNLINK
JWHEC,JWHET,
ALL,BACK
UNLINK
HVYPC,HVYPT,
ALL,BACK
UNLINK
LITPC,LITPT,
ALL,BACK
TRANSFER
FN
FNSFTHTH
UNLINK
SKCKC,SKCKE
6,BACK
UNLINK
CRTEC,CRTEE,
5,BACK
UNLINK
DRTEC,DRTEE,
3,BACK
UNLINK
DEEXC,DEEXE,
2,BACK
UNLINK
SCNTE,SCNTE,
4,BACK
UNLINK
STOFC,STOFE,
1,BACK
4B
4B
UNLINK
YMCSC,YMCSE,
11,BACK
UNLINK
YKCSC,YKCSE,
4,BACK
UNLINK
DRYWC,DRYWE,
2,BACK
UNLINK
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2,BACK
UNLINK
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2,BACK
UNLINK
MAINC,MAINE
8,BACK
UNLINK
FWHEC,FWHEE,
1,BACK
UNLINK
JWHEC,JWHEE,
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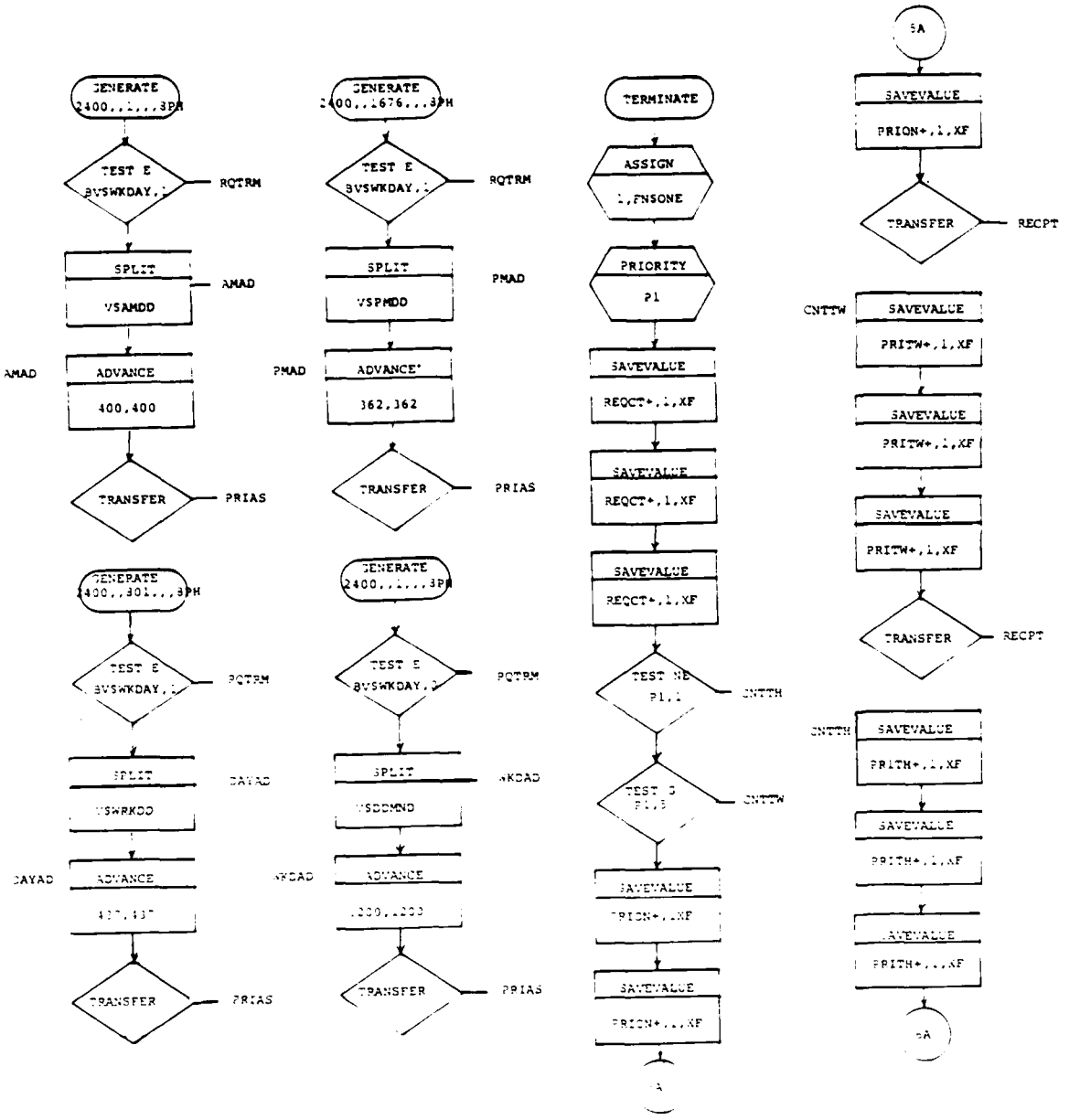
TRANSFER
FN
FNSFTHTH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AMAD
ADVANCE
400,400
TRANSFER
PRIAS
GENERATE
2400,,1676,,,3PH
TEST E
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RQTRM
SPLIT
VSPMDD
PMAD
ADVANCE
362,362
TRANSFER
PRIAS
GENERATE
2400,,301,,,3PH
TEST E
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RQTRM
SPLIT
VSWKDD
DAYAD
ADVANCE
437,437
TRANSFER
PRIAS
GENERATE
2400,,1,,,3PH
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RQTRM
SPLIT
VSDDMND
WKDAD
ADVANCE
1200,1200
TRANSFER
PRIAS
TERMINATE
ASSIGN
1,FNSONE
PRIORITY
P1
SAVEVALUE
REQCT+,1,XF
SAVEVALUE
REQCT+,1,XF
SAVEVALUE
REQCT+,1,XF
TEST NE
P1,1
CNTTH
TEST E
P1,5
CNTTW
SAVEVALUE
PRION+,1,XF
SAVEVALUE
PRION+,1,XF
5A
SAVEVALUE
PRION+,1,XF
TRANSFER
RECPT
CNTTW
SAVEVALUE
PRITW+,1,XF
SAVEVALUE
PRITW+,1,XF
SAVEVALUE
PRITW+,1,XF
TRANSFER
RECPT
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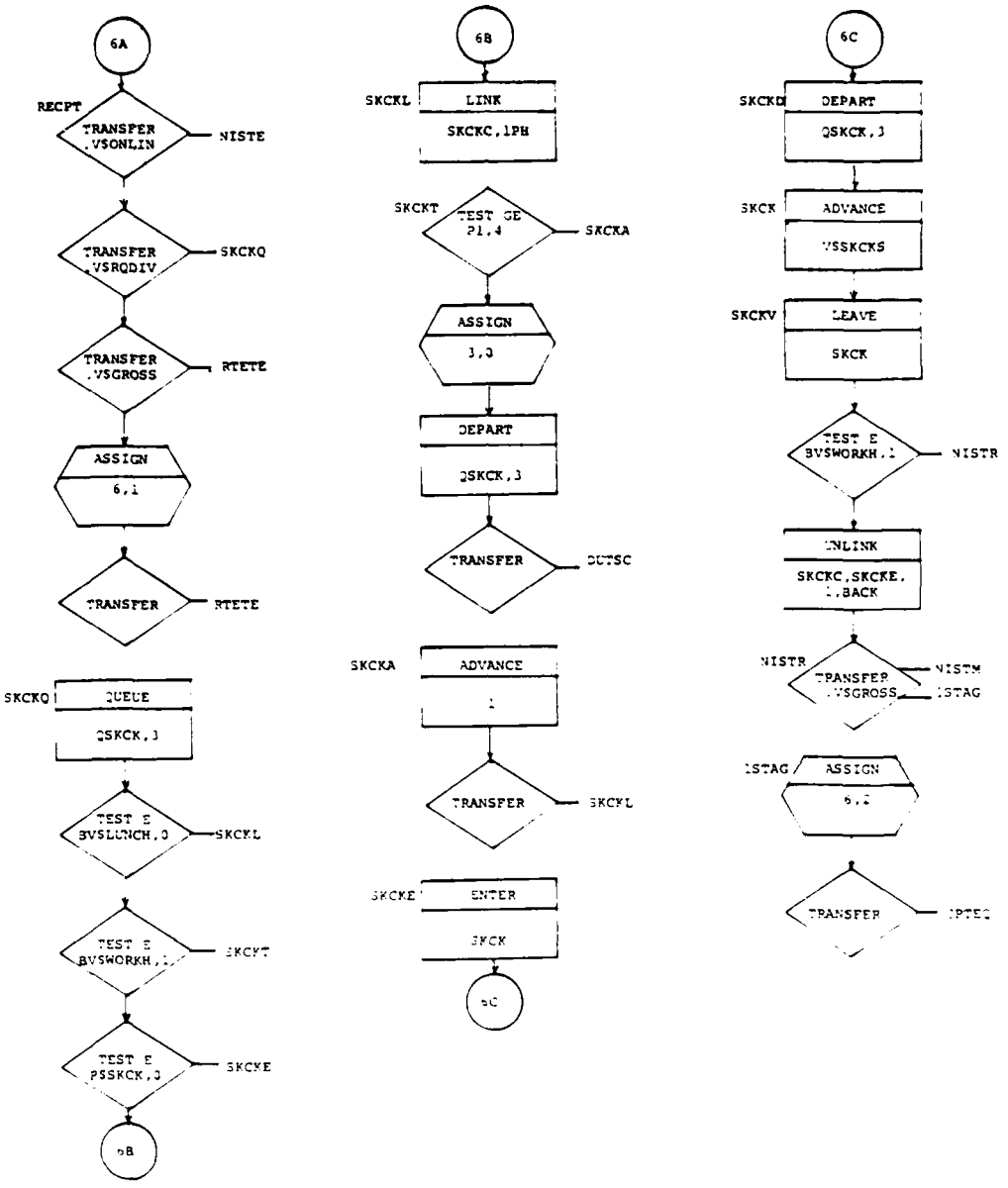
PRITH+,1,XF
5A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TRANSFER
RTETE
SKCKQ
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SKCKL
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SKCKE
6B
6B
SKCKL
LINK
SKCKC,1PH
SKCKT
TEST GE P1,4
SKCKA
ASSIGN
3,0
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ADVANCE
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SKCKE
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6C
6C
SKCKD
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ADVANCE
VSSKCKS
SKCKV
LEAVE
SKCK
TEST E BVSWORKH,1
NISTR
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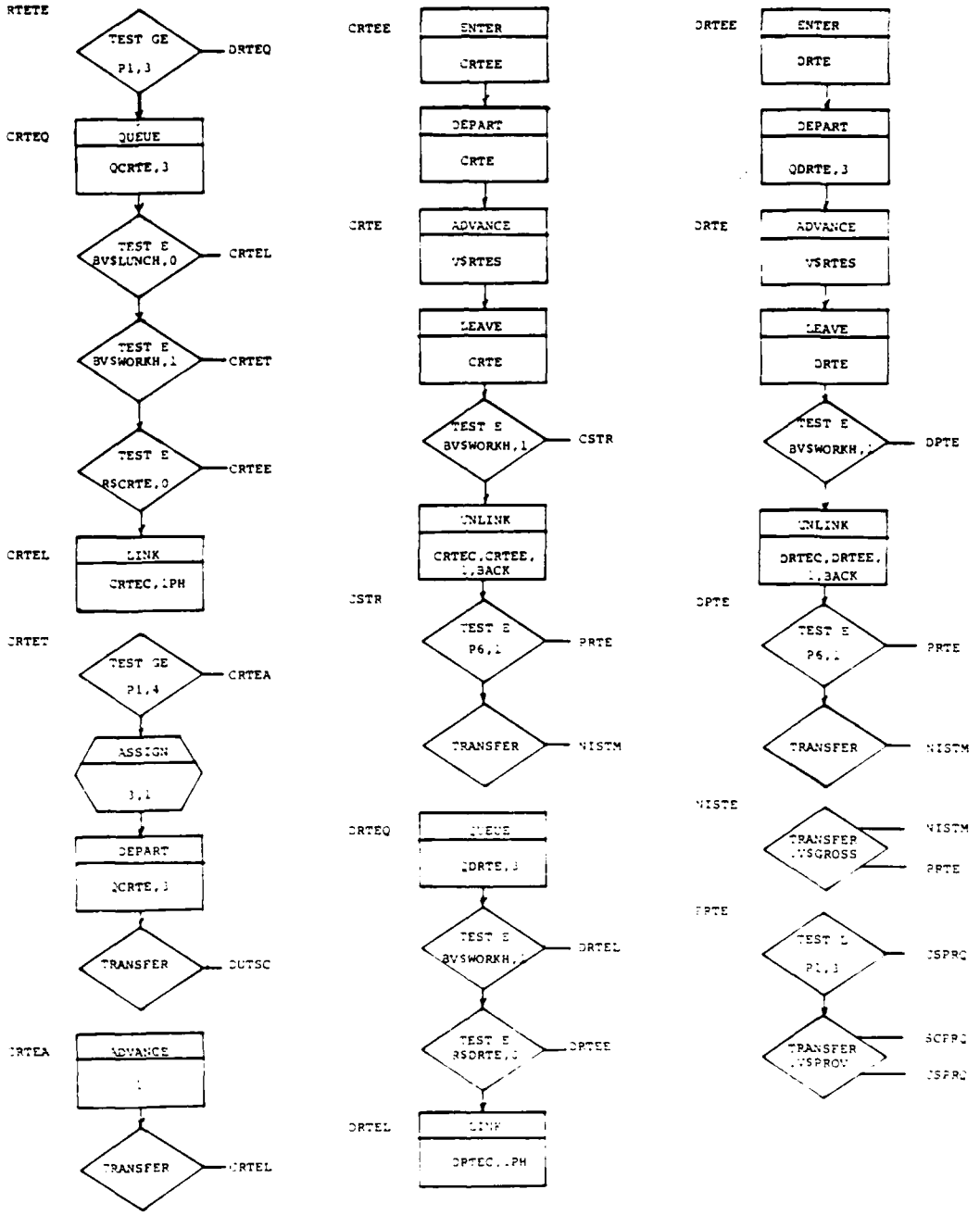
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CRTEE
CRTEL
LINK CRTEC,1PH
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TEST GE P1,4
CRTEA
ASSIGN 3,1
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CRTEA
ADVANCE
TRANSFER
CRTEL
CRTEE
ENTER CRTEE
DEPART CRTE
CRTE
ADVANCE VSRTES
LEAVE CRTE
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CSTR
UNLINK CRTEC,CRTEE,1,BACK
CSTR
TEST E P6,1
PRTE
TRANSFER
NISTM
DRTEQ
QUEUE QDRTE,3
TEST E BVSWORKH,1
DRTEL
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DPTEE
DRTEL
LINK DPTEC,1PH
DRTEE
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DEPART QDRTE,3
DRTE
ADVANCE VSRTES
LEAVE DRTE
TEST E BVSWORKH,1
DPTE
UNLINK DRTEC,DRTEE,1,BACK
DPTE
TEST E P6,1
PRTE
TRANSFER
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PRTE
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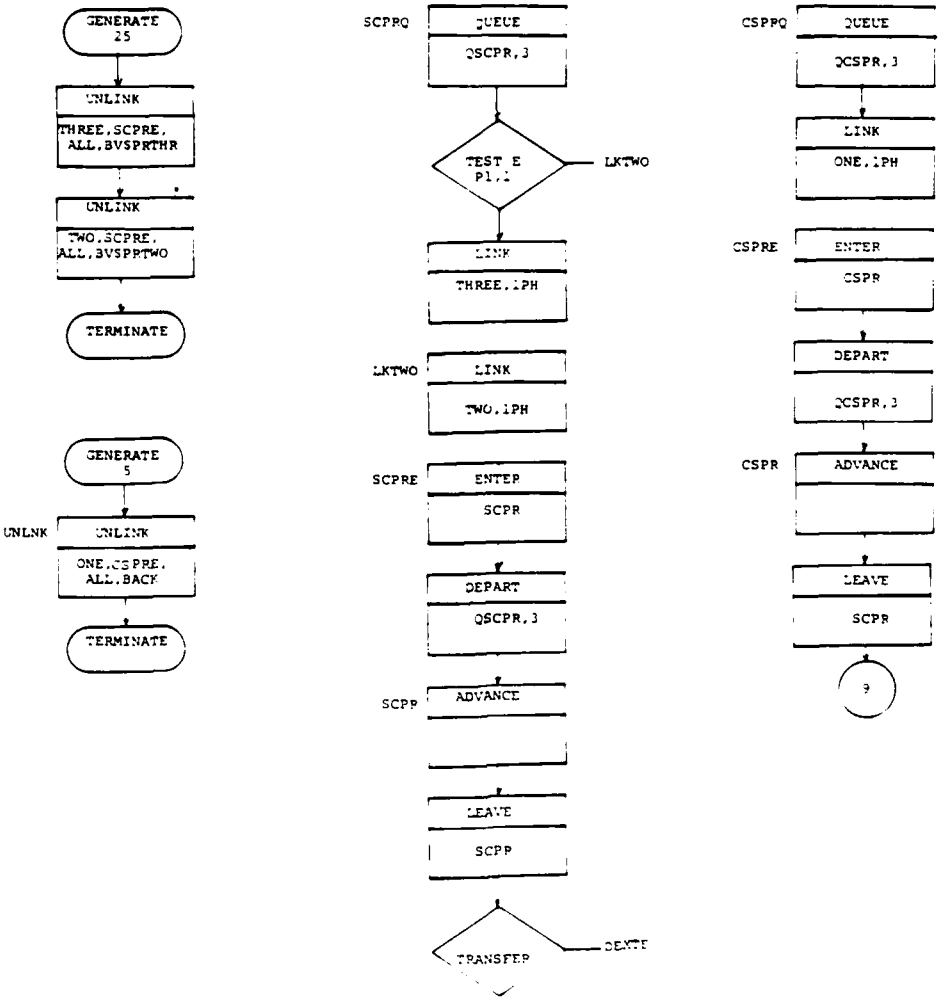
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P1,1
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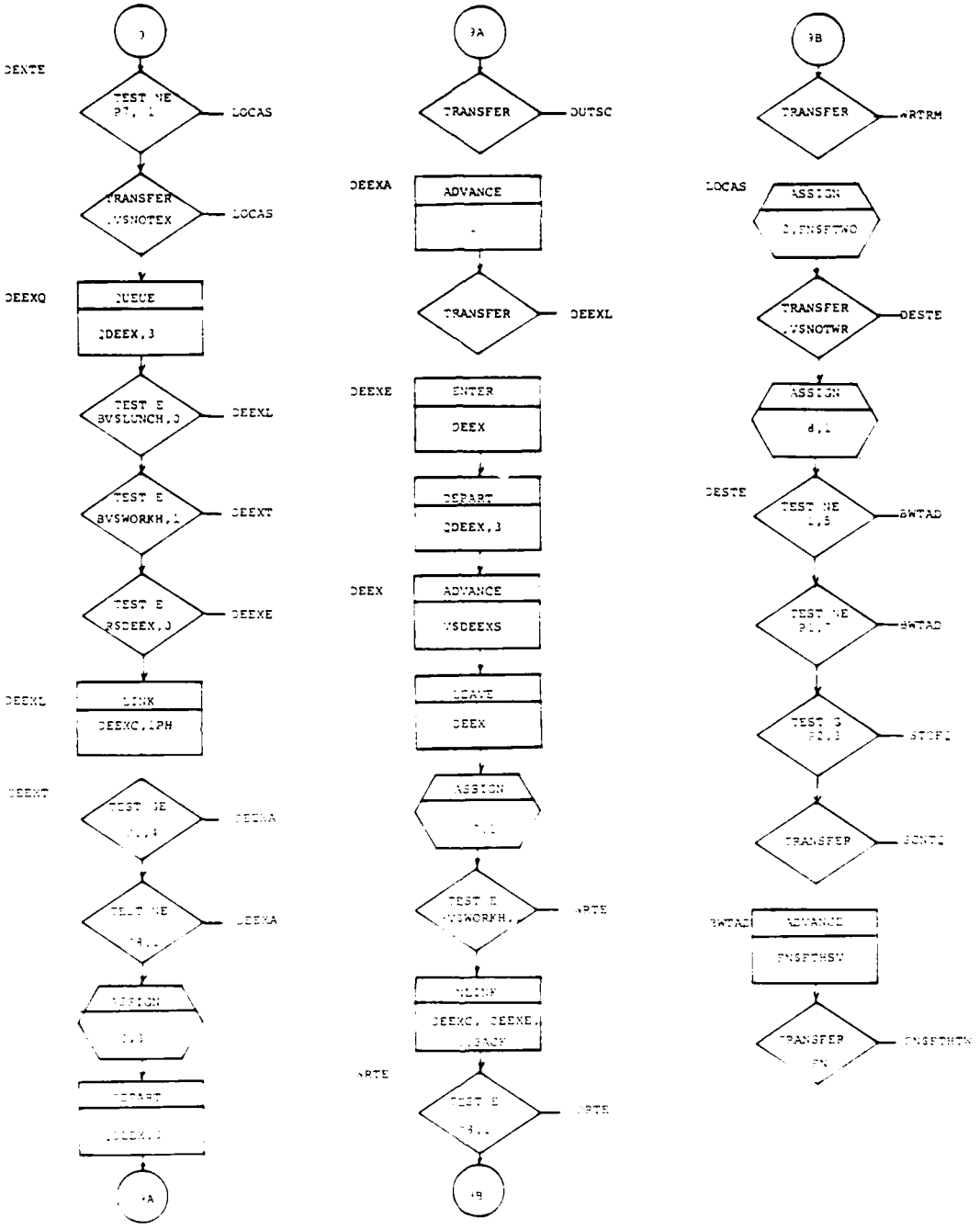
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TEST E
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DEEXL
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DEEXC,1PH
DEEXT
DEEXA
DEEXA
TERMIN
DEPART
QDEEX,3
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TRANSFER
DEEXL
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ADVANCE
VSDEEXS
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XRTE
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XRTE
LOCAS
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TRANSFER
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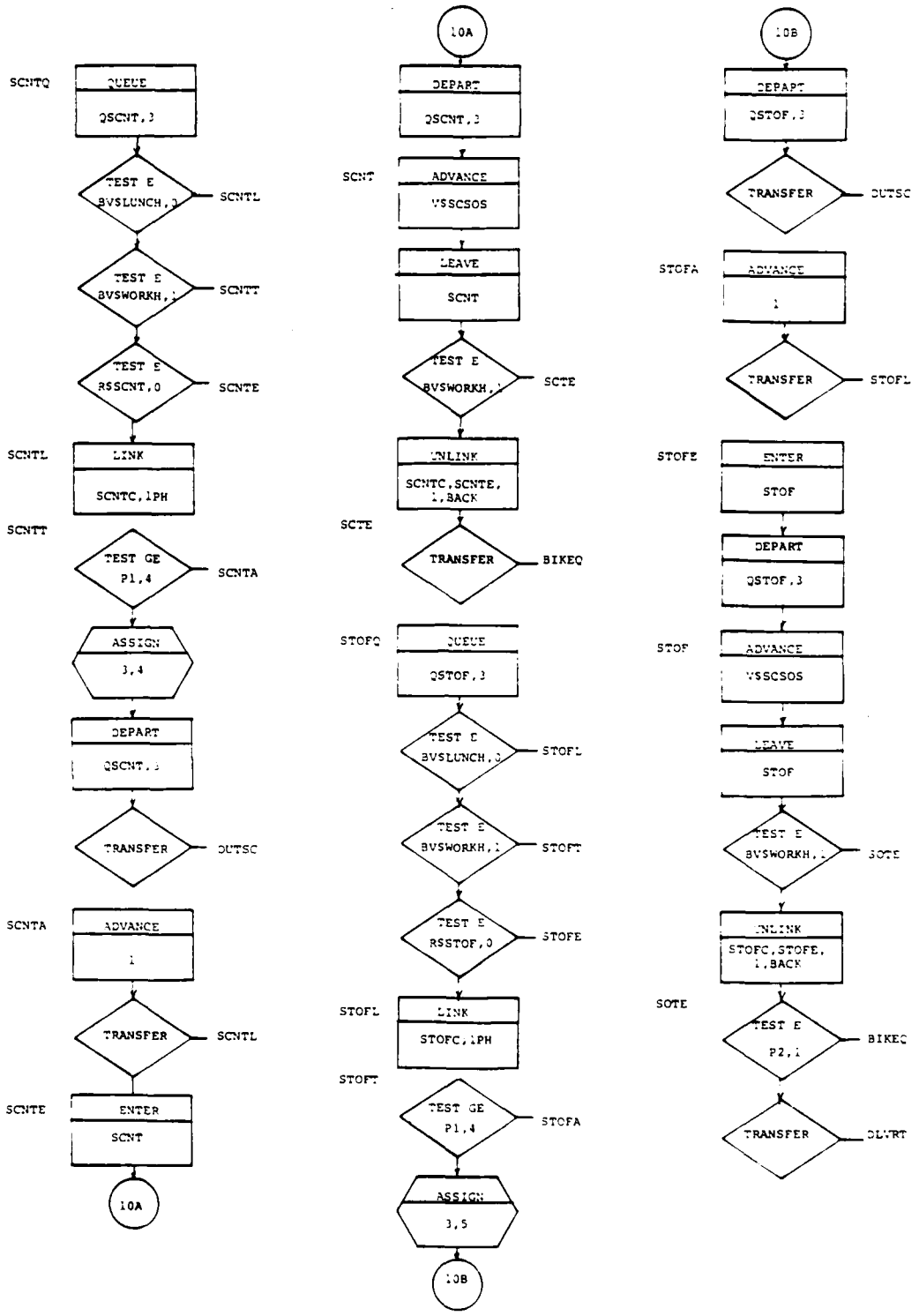
TRANSFER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SCNTE
SCNTL
LINK
SCNTC,1PH
SCNTT
TEST GE
P1,4
SCNTA
ASSIGN
3,4
DEPART
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TRANSFER
SCNTL
SCNTE
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10A
DEPART
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ADVANCE
VSSCSOS
LEAVE
SCNT
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UNLINK
SCNTC,SCNTE,
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TRANSFER
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TEST E
BVSWORKH,1
STOFT
TEST E
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LINK
STOFC,1PH
STOFT
TEST GE
P1,4
STOFA
ASSIGN
3,5
10B
10B
DEPART
QSTOF,3
TRANSFER
OUTSC
STOFA
ADVANCE
1
TRANSFER
STOFL
STOFE
ENTER
STOF
DEPART
QSTOF,3
STOF
ADVANCE
VSSCSOS
LEAVE
STOF
TEST E
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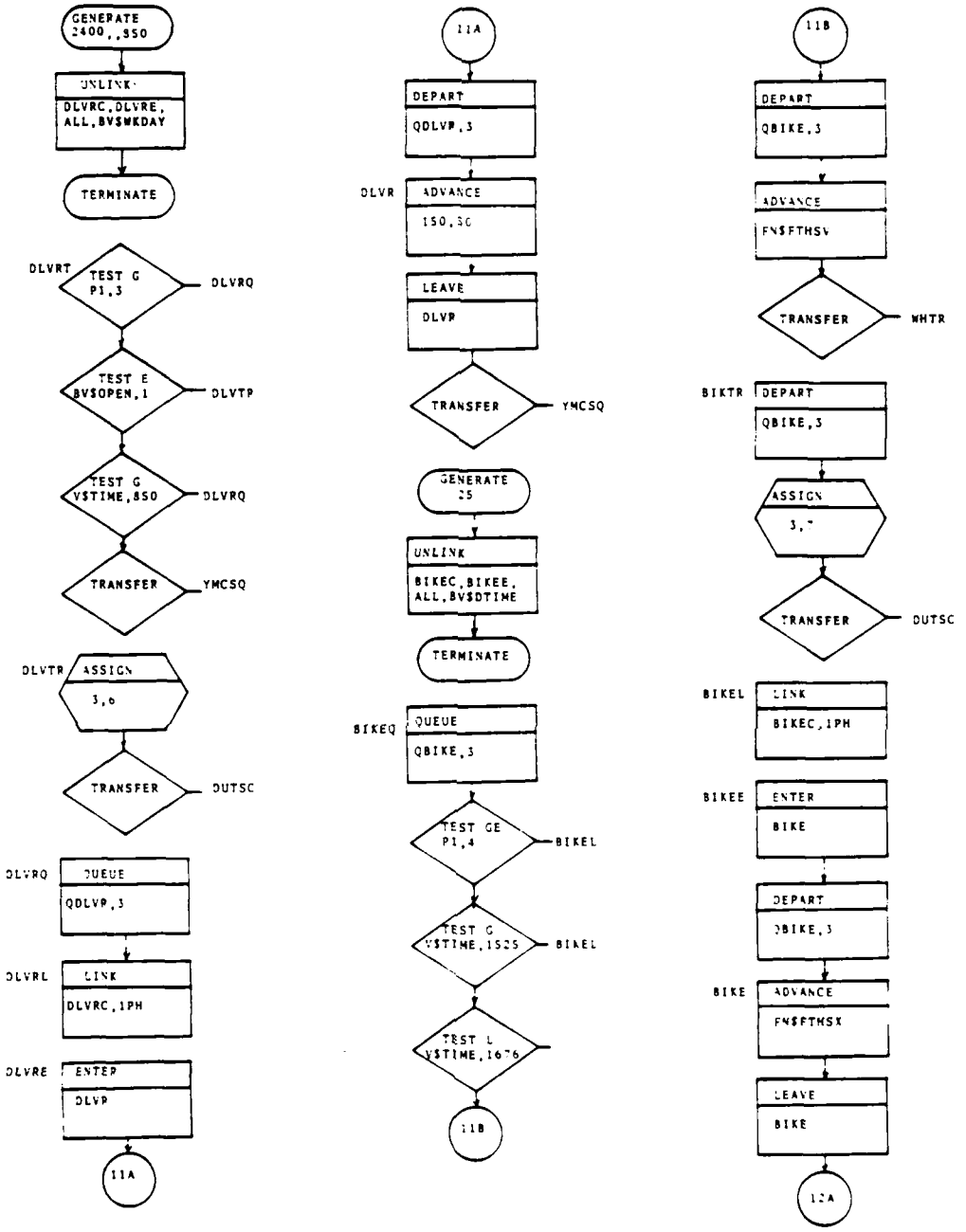
P2,1
BIKEQ
TRANSFER
OUTRT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DLVTP
TEST G
V$TIME,850
DLVRQ
TRANSFER
YMCSQ
DLVTR
ASSIGN
3,6
TRANSFER
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QUEUE
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DLVRL
LINK
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DLVRE
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DLVP
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DLVR
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TRANSFER
YMCSQ
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BIKEQ
QUEUE
QBIKE,3
TEST GE
P1,4
BIKEL
TEST G
V$TIME,1525
BIKEL
TEST L
V$TIME,1676
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11B
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ADVANCE
FN$FTHSV
TRANSFER
WHTR
BIKTR
DEPART
QBIKE,3
ASSIGN
3,7
TRANSFER
OUTSC
BIKEL
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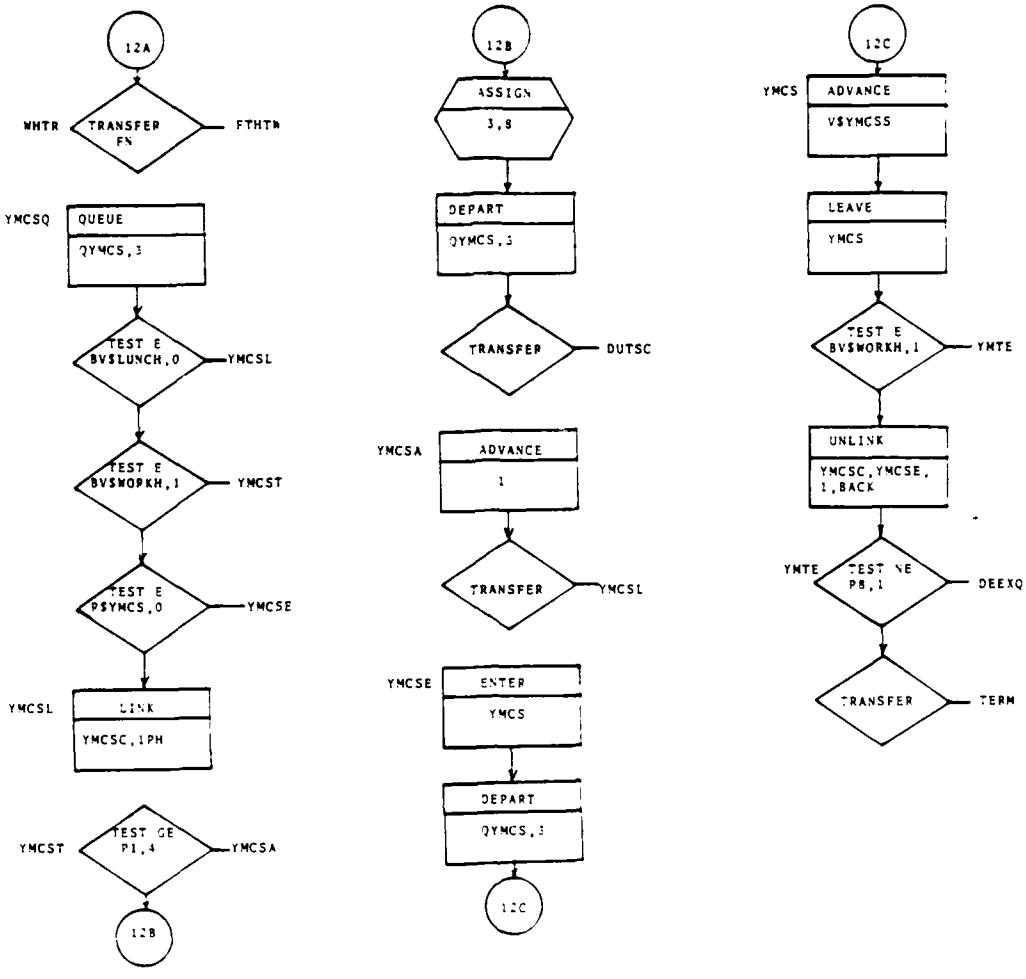
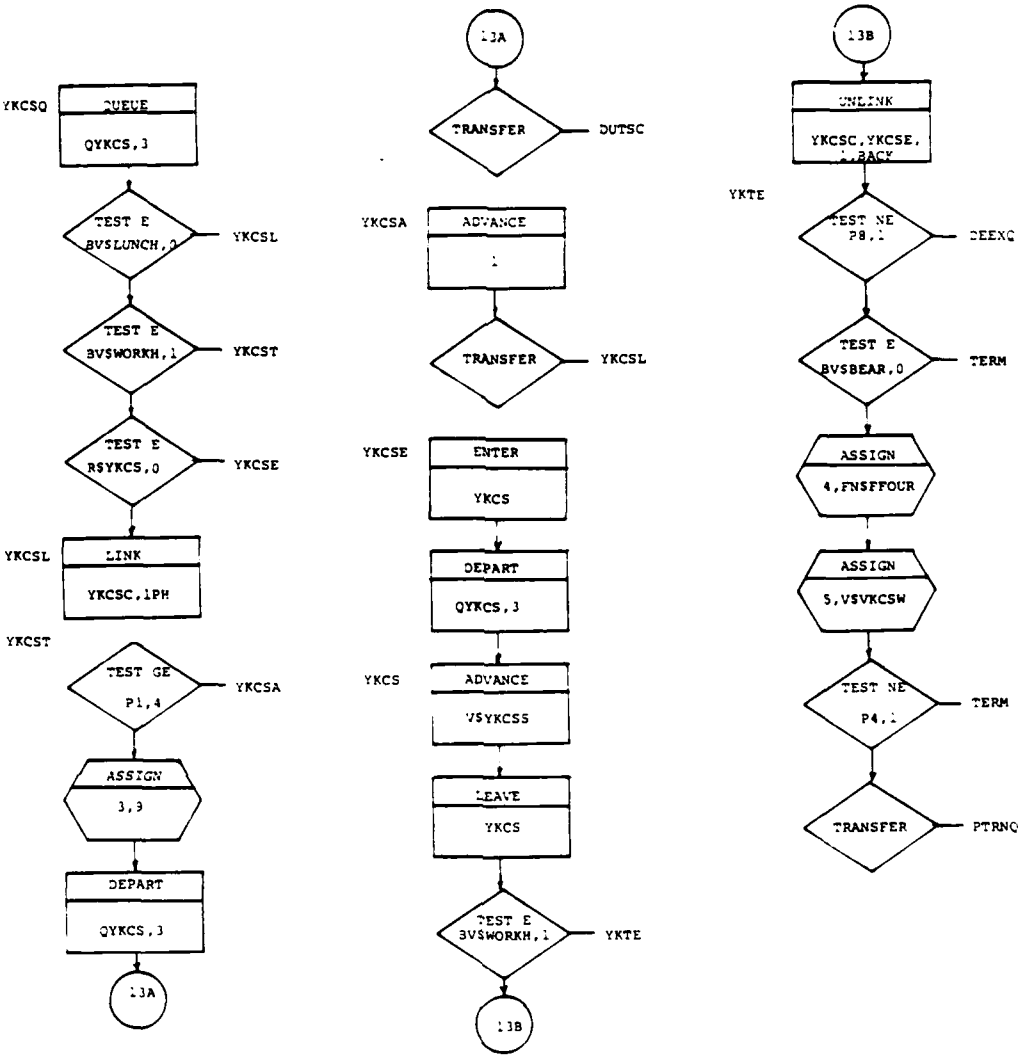
12A


12A
WHTR
TRANSFER
FN
FTHTR
YMCSQ
QUEUE
QYMCS,3
TEST E
BV$LUNCH,0
YMCSL
TEST E
BV$WORKH,1
YMCST
TEST E
P$YMCS,0
YMCSE
YMCSL
LINK
YMCSC,1PH
YMCST
TEST GE
P1,4
YMCSA
12B
12B
ASSIGN
3,8
DEPART
QYMCS,3
TRANSFER
DUTSC
YMCSA
ADVANCE
1
TRANSFER
YMCSL
YMCSE
ENTER
YMCS
DEPART
QYMCS,3
12C
12C
YMCS
ADVANCE
V$YMCSS
LEAVE
YMCS
TEST E
BV$WORKH,1
YMTE
UNLINK
YMCSC,YMCSE,
1,BACK
YMTE
TEST NE
P8,1
DEEXQ
TRANSFER
TERM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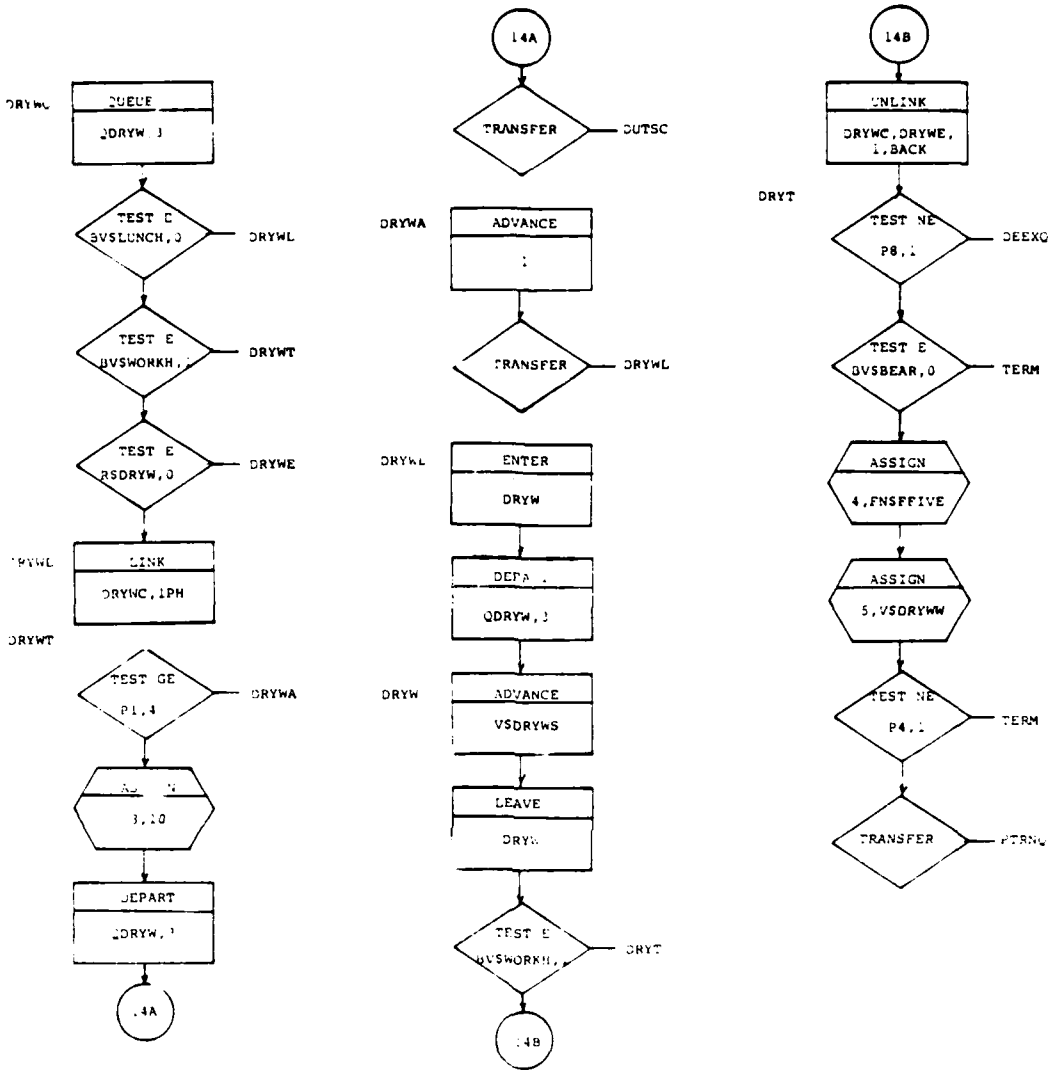
QYKCS,3
TEST E
BVSLUNCH,0
YKCSL
TEST E
BVSWORKH,1
YKCST
TEST E
R$YKCS,0
YKCSE
YKCSL
LINK
YKCSC,1PH
YKCST
TEST GE
P1,4
YKCSA
ASSIGN
3,9
DEPART
QYKCS,3
13A
13A
TRANSFER
DUTSC
YKCSA
ADVANCE
1
TRANSFER
YKCSL
YKCSE
ENTER
YKCS
DEPART
QYKCS,3
YKCS
ADVANCE
V$YKCSS
LEAVE
YKCS
TEST E
BVSWORKH,1
YKTE
13B
13B
UNLINK
YKCSC,YKCSE,
,BACK
YKTE
TEST NE
P8,1
DEEXC
TEST E
BVSBEAR,0
TERM
ASSIGN
4,FNSFFOUR
ASSIGN
5,V$VKCSW
TEST NE
P4,1
TERM
TRANSFER
PTRNQ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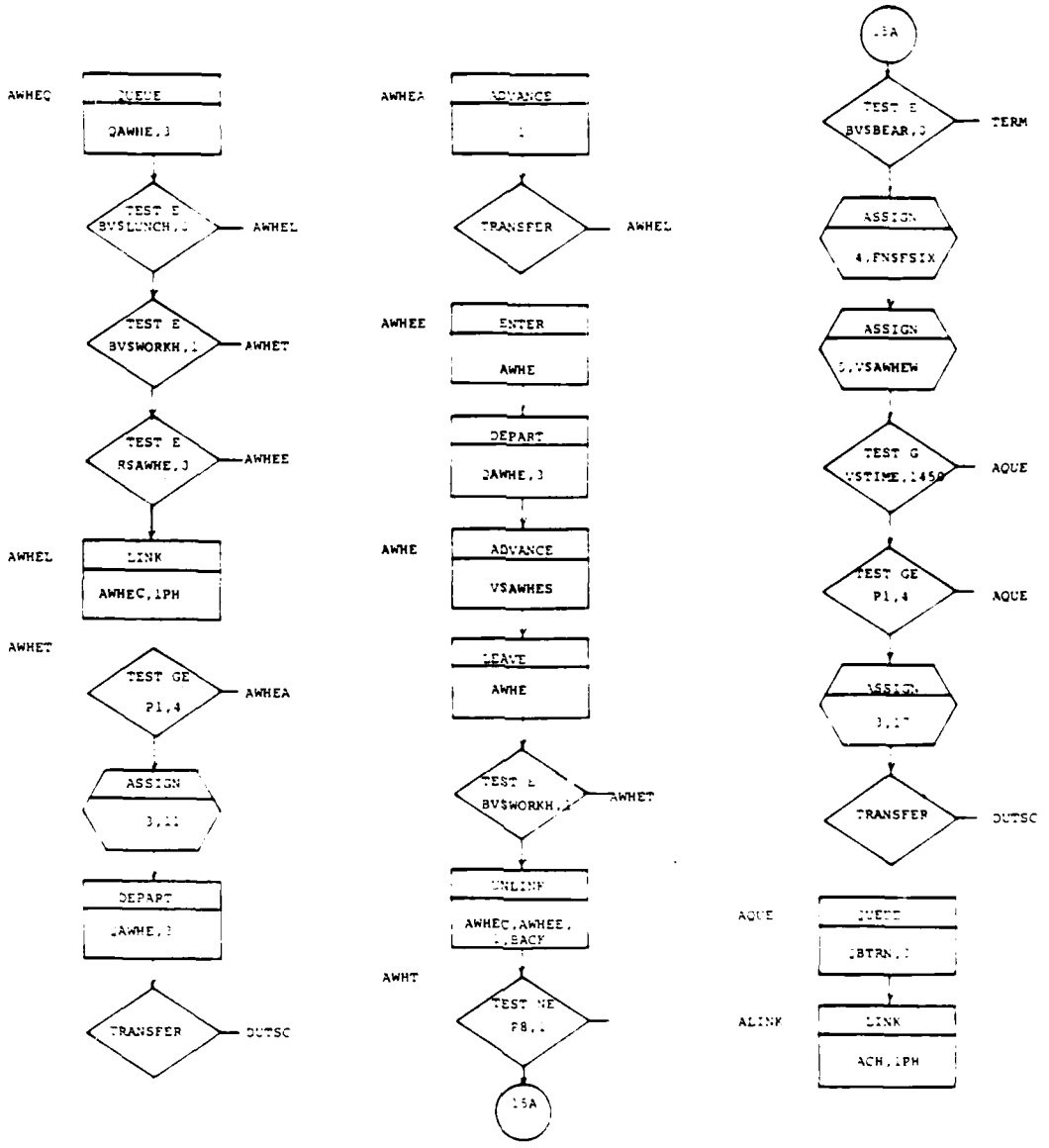
BVSLUNCH,0
DRYWL
TEST E
BVSWORKH,1
DRYWT
TEST E
BSDRYW,0
DRYWE
DRYWL
LINK
DRYWC,1PH
DRYWT
TEST GE
P1,4
DRYWA
ADVANCE
3,10
DEPART
QDRYW,1
14A
14A
TRANSFER
OUTSC
DRYWA
ADVANCE
1
TRANSFER
DRYWL
DRYWL
ENTER
DRYW
DEPART
QDRYW,1
DRYW
ADVANCE
VSDRYWS
LEAVE
DRYW
TEST E
BVSWORKH,1
DRYT
14B
14B
UNLINK
DRYWC,DRYWE,
1,BACK
DRYT
TEST NE
P8,1
DEEXQ
TEST E
BVSBEAR,0
TERM
ASSIGN
4,FNSFFIVE
ASSIGN
5,VSDRYWW
TEST NE
P4,1
TERM
TRANSFER
RTRNQ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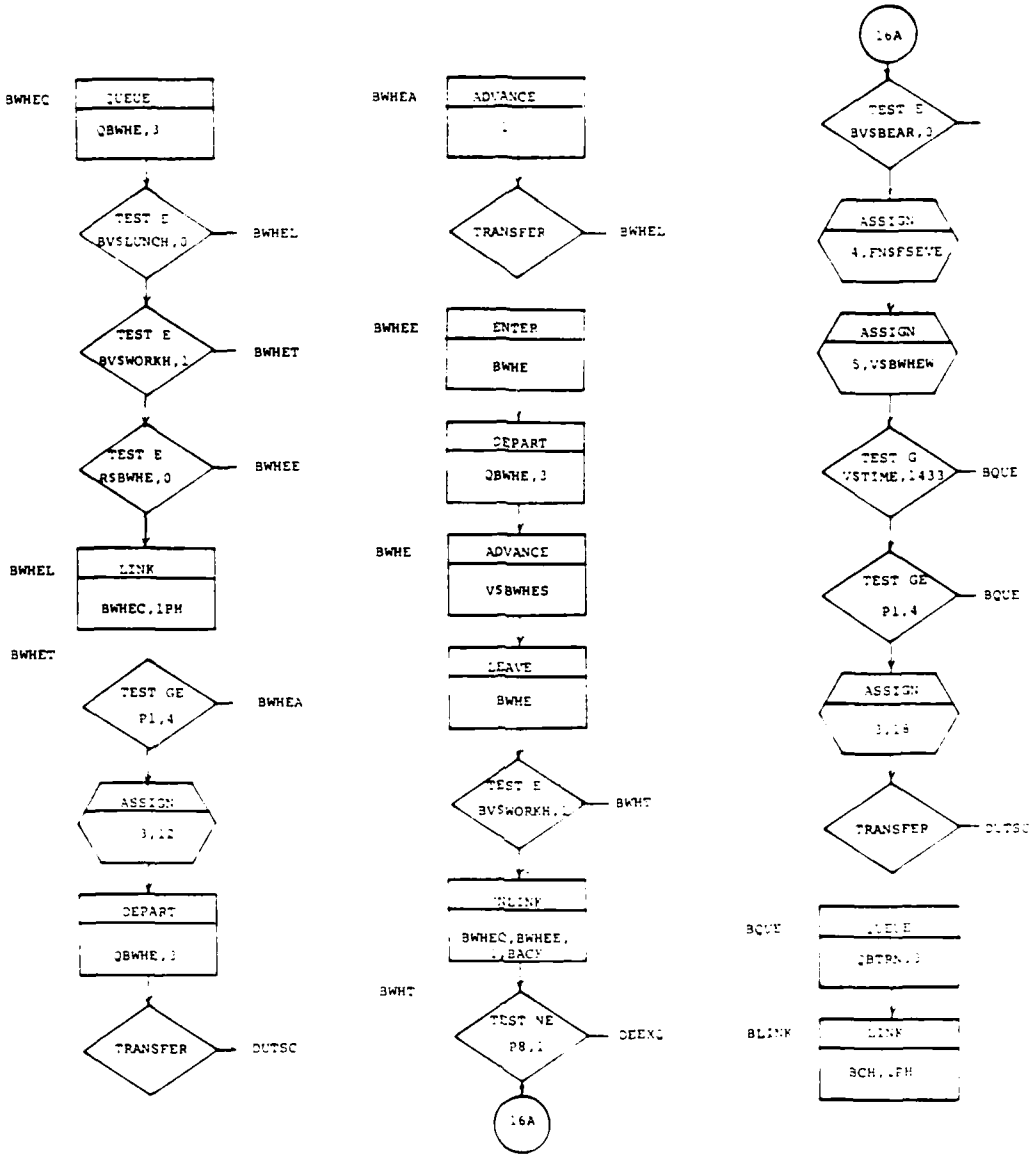
QUEUE
QAWHE,3
TEST E
BVSLUNCH,3
AWHEL
TEST E
BVSWORKH,1
AWHET
TEST E
RSAWHE,3
AWHEE
AWHEL
LINK
AWHEC,1PH
AWHET
TEST GE
P1,4
AWHEA
ASSIGN
3,11
DEPART
LAWHE,3
TRANSFER
OUTSC
AWHEA
ADVANCE
1
TRANSFER
AWHEL
AWHEE
ENTER
AWHE
DEPART
QAWHE,3
AWHE
ADVANCE
VSAWHES
LEAVE
AWHE
TEST E
BVSWORKH,1
AWHET
UNLINK
AWHEC,AWHEE,
1,BACK
AWHT
TEST NE
P8,1
15A
15A
TEST E
BVSBEAR,3
TERM
ASSIGN
4,FNSFSIX
ASSIGN
3,VSAWHEW
TEST G
VSTIME,1450
AQUE
TEST GE
P1,4
AQUE
ASSIGN
3,17
TRANSFER
OUTSC
AQUE
QUEUE
QBTRN,1
ALINK
LINK
ACH,1PH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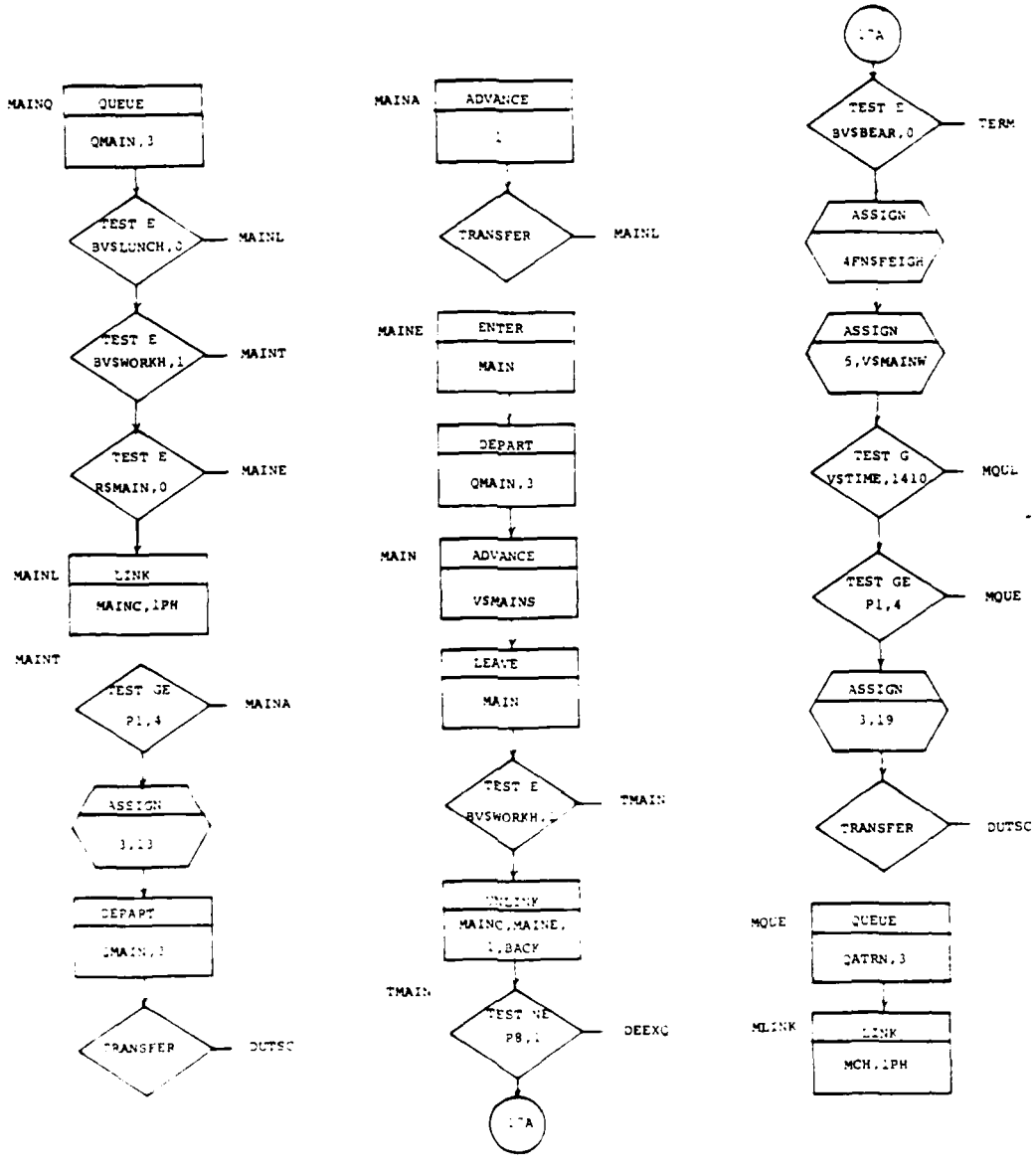
BWHEL
TEST E
BVSWORKH,1
BWHET
TEST E
RSBWHE,0
BWHEE
BWHEL
LINK
BWHEC,1PH
BWHET
TEST GE
P1,4
BWHEA
ASSIGN
3,12
DEPART
QBWHE,3
TRANSFER
DUTSC
BWHEA
ADVANCE
TRANSFER
BWHEL
BWHEE
ENTER
BWHE
DEPART
QBWHE,3
BWHE
ADVANCE
VSBWHES
LEAVE
BWHE
TEST E
BVSWORKH,1
BWHT
LINK
BWHEC,BWHEE,
,BACK
BWHT
TEST NE
P8,1
DEEXC
16A
16A
TEST E
BVSBEAR,0
ASSIGN
4,FNSFSEVE
ASSIGN
5,VSBWHEW
TEST G
VSTIME,1433
BQUE
TEST GE
P1,4
BQUE
ASSIGN
3,19
TRANSFER
DUTSC
BQUE
QUEUE
QBTRN,3
BLINK
LINK
BCH,,1H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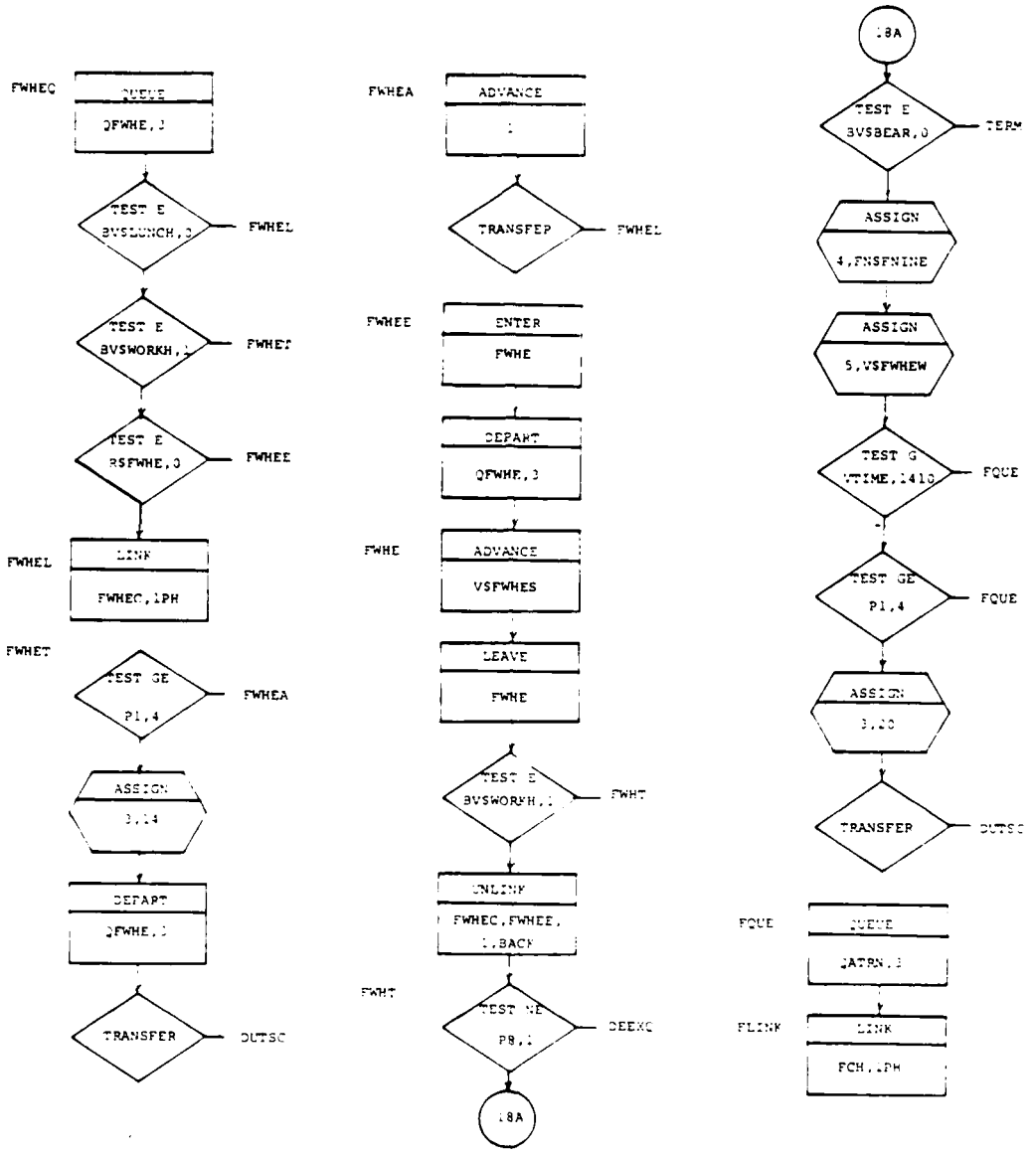
QMAIN,3
TEST E
BVSLUNCH,0
MAINL
TEST E
BVSWORKH,1
MAINT
TEST E
RSMAIN,0
MAINE
MAINL
LINK
MAINC,1PH
MAINT
TEST GE
P1,4
MAINA
ASSIGN
3,13
DEPART
QMAIN,3
TRANSFER
OUTSC
MAINA
ADVANCE
1
TRANSFER
MAINL
MAINE
ENTER
MAIN
DEPART
QMAIN,3
MAIN
ADVANCE
VSMAINS
LEAVE
MAIN
TMAIN
MAINC,MAINE,
1,BACK
TMAIN
DEEXC
ATA
ATA
TEST E
BVSBEAR,0
TERM
ASSIGN
4FNSFEIGH
ASSIGN
5,VSMAINW
TEST G
VSTIME,1410
MQUE
TEST GE
P1,4
MQUE
ASSIGN
3,19
TRANSFER
OUTSC
MQUE
QUEUE
QATRN,3
MLINK
LINK
MCH,1PH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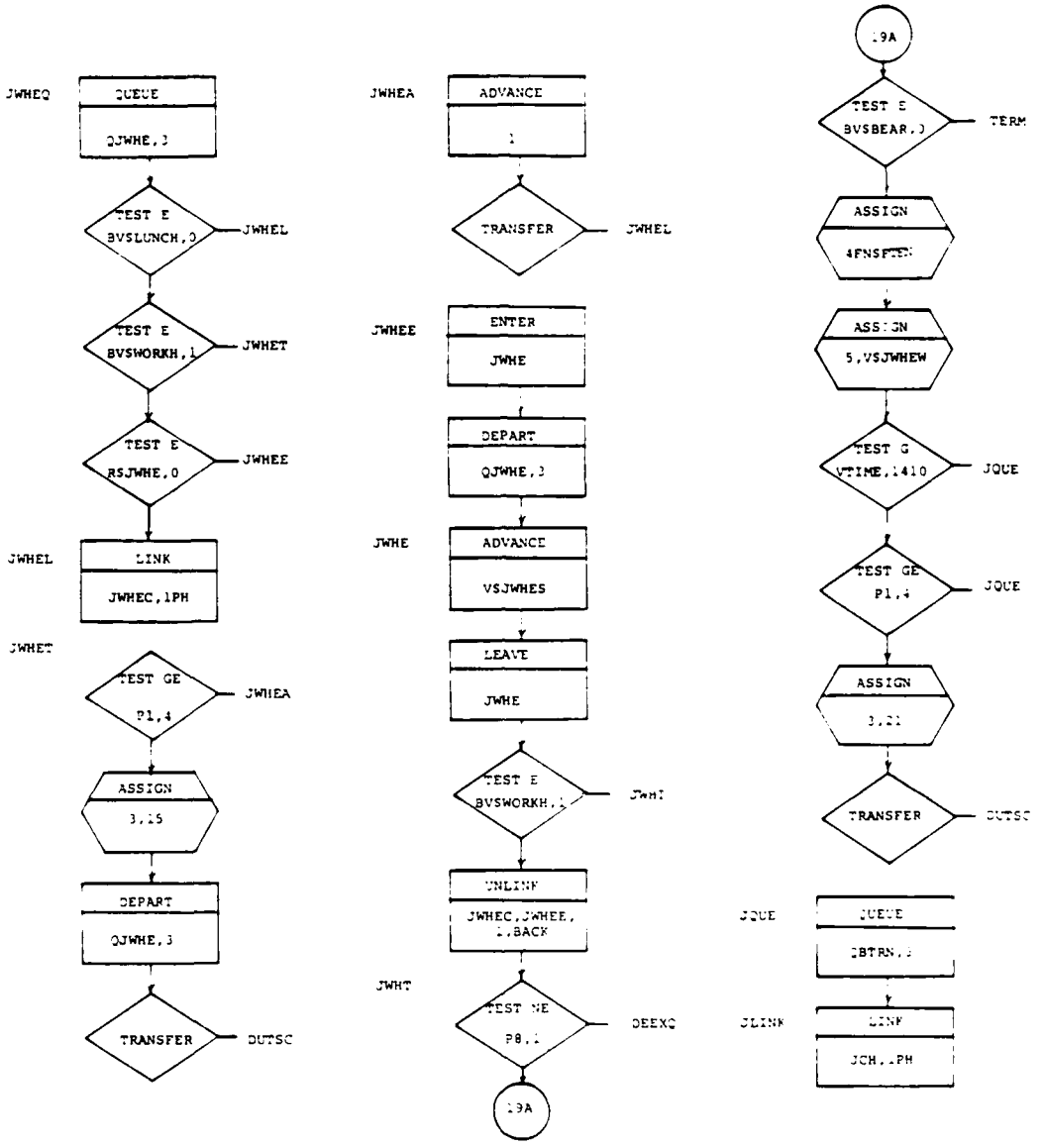
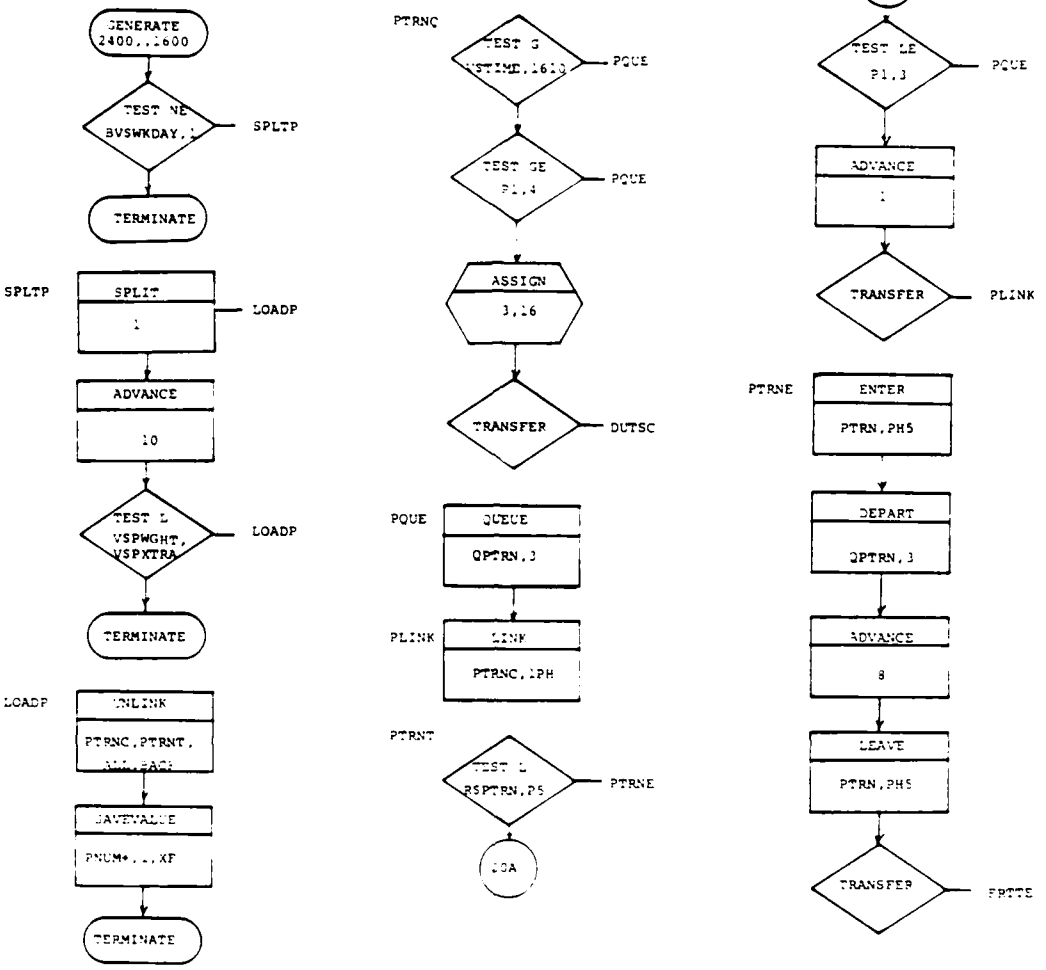
QFWHE,1
TEST E
BVSLUNCH,0
FWHEL
TEST E
BVSWORKH,1
FWHET
TEST E
RSFWHE,0
FWHEE
FWHEL
LINK
FWHEC,1PH
FWHET
TEST GE
P1,4
FWHEA
ASSIGN
3,14
DEPART
QFWHE,1
TRANSFER
OUTSC
FWHEA
ADVANCE
1
TRANSFER
FWHEL
FWHEE
ENTER
FWHE
DEPART
QFWHE,1
FWHE
ADVANCE
VSFWHES
LEAVE
FWHE
TEST E
BVSWORKH,1
FWHT
UNLINK
FWHEC,FWHEE,
1,BACK
FWHT
TEST NE
P8,1
DEEXC
18A
18A
TEST E
BVSBEAR,0
TERM
ASSIGN
4,FNSFNINE
ASSIGN
5,VSFWHEW
TEST G
VTIME,1410
FQUE
TEST GE
P1,4
FQUE
ASSIGN
3,20
TRANSFER
OUTSC
FQUE
QUEUE
QATRN,1
FLINK
LINK
FCH,1PH


JWHEQ
QUEUE
QJWHE,3
TEST E BVSLUNCH,0
JWHEL
TEST E BVSWORKH,1
JWHET
TEST E RSJWHE,0
JWHEE
JWHEL
LINK
JWHEC,1PH
JWHET
TEST GE P1,4
JWHEA
ASSIGN
3,15
DEPART
QJWHE,3
TRANSFER
OUTSC
JWHEA
ADVANCE
1
TRANSFER
JWHEL
JWHEE
ENTER
JWHE
DEPART
QJWHE,3
JWHE
ADVANCE
VSJWHES
LEAVE
JWHE
TEST E BVSWORKH,1
JWHT
UNLINK
JWHEC,JWHEE,1,BACK
JWHT
TEST NE P8,1
DEEXC
19A
19A
TEST E BVSBEAR,0
TERM
ASSIGN
4FNSFER
ASSIGN
5,VSJWHEW
TEST G VTIME,1410
JQUE
TEST GE P1,4
JQUE
ASSIGN
3,21
TRANSFER
OUTSC
JQUE
QUEUE
QBTRN,3
JLINK
LINK
JCH,1PH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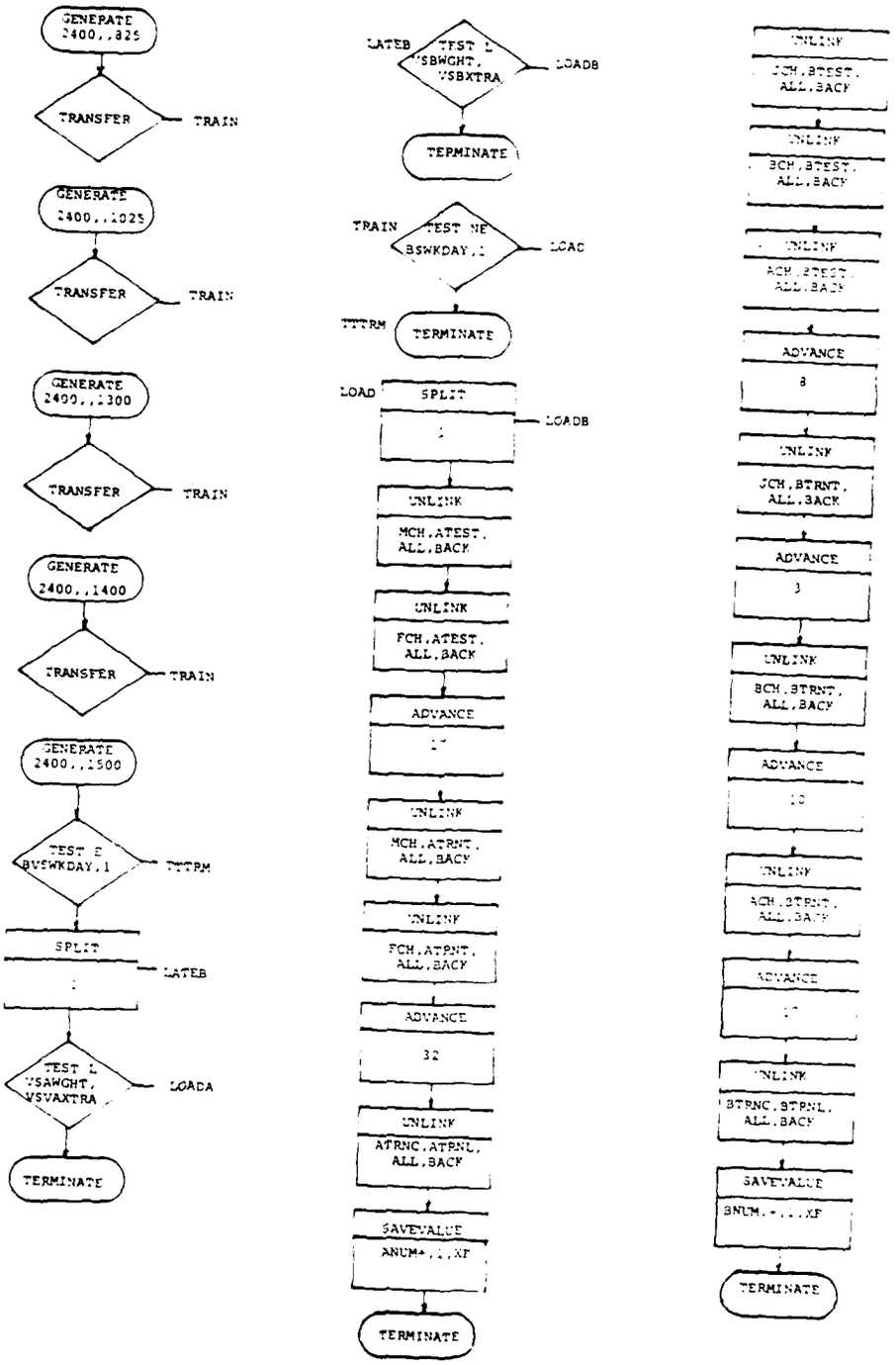
2400,,1600
TEST NE
BVSWKDAY,1
SPLTP
TERMINATE
SPLTP
SPLIT
1
LOADP
ADVANCE
10
TEST L
VSPWGHT,
VSPXTRA
LOADP
TERMINATE
LOADP
UNLINK
PTRNC,PTRNT,
SAVEVALUE
PNUM*,,XF
TERMINATE
PTRNC
TEST G
VSTIME,1610
PQUE
TEST GE
P1,4
PQUE
ASSIGN
3,16
TRANSFER
DUTSC
PQUE
QUEUE
QPTRN,3
PLINK
LINK
PTRNC,1PH
PTRNT
TEST L
RSPTRN,P5
PTRNE
20A
20A
TEST LE
P1,3
PQUE
ADVANCE
1
TRANSFER
PLINK
PTRNE
ENTER
PTRN,PH5
DEPART
QPTRN,3
ADVANCE
8
LEAVE
PTRN,PH5
TRANSFER
PRTTS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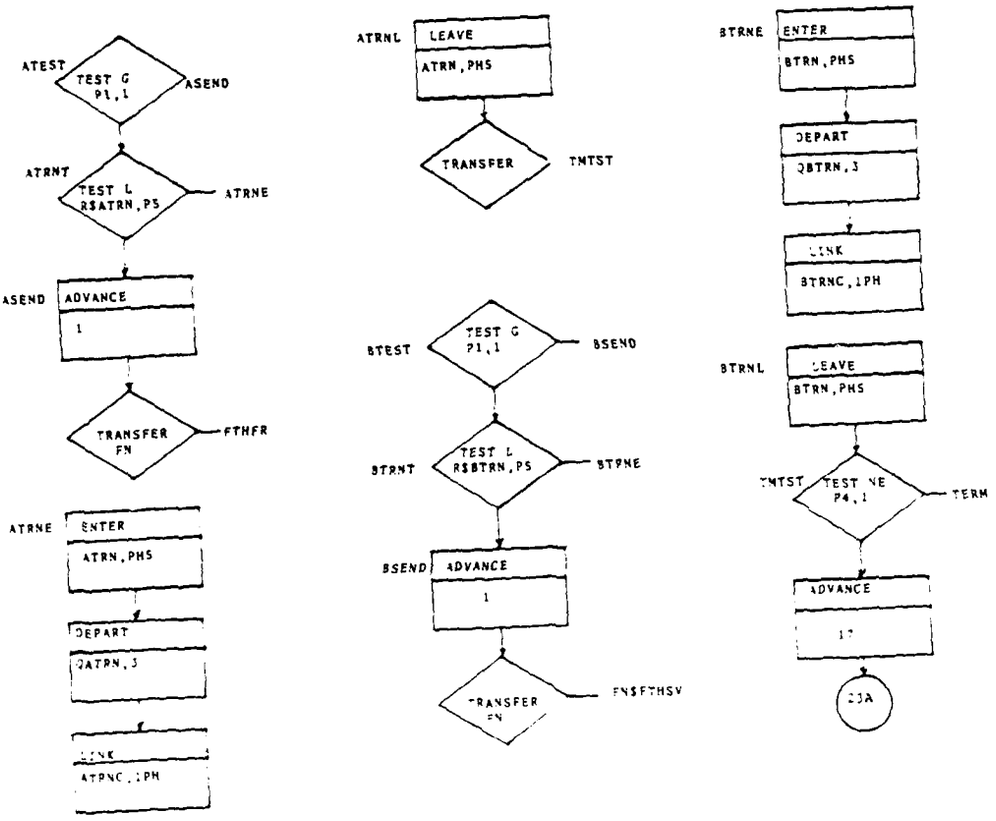
TRANSFER
TRAIN
GENERATE
2400,,1025
TRANSFER
TRAIN
GENERATE
2400,,1300
TRANSFER
TRAIN
GENERATE
2400,,1400
TRANSFER
TRAIN
GENERATE
2400,,1500
TEST E
BVSWKDAY,1
TTTRM
SPLIT
1
LATEB
TEST L
VSAWGHT,
VSVAXTRA
LOADA
TERMINATE
LATEB
TEST L
VSBWGHT,
VSBXTRA
LOADB
TERMINATE
TRAIN
TEST NE
BSWKDAY,1
LOAD
TTTRM
TERMINATE
LOAD
SPLIT
1
LOADB
UNLINK
MCH,ATEST,
ALL,BACK
UNLINK
FCH,ATEST,
ALL,BACK
ADVANCE
UNLINK
MCH,ATRNT,
ALL,BACK
UNLINK
FCH,ATRNT,
ALL,BACK
ADVANCE
32
UNLINK
ATRNC,ATRNL,
ALL,BACK
SAVEVALUE
ANUM+,1,XF
TERMINATE
UNLINK
UNLINK
BCH,BTEST,
ALL,BACK
UNLINK
ADVANCE
8
UNLINK
JCH,BTRNT,
ALL,BACK
ADVANCE
3
UNLINK
BCH,BTRNT,
ALL,BACK
ADVANCE
10
UNLINK
ACH,BTRNT,
ALL,BACK
ADVANCE
UNLINK
BTRNC,BTRNL,
ALL,BACK
SAVEVALUE
BNUM+,1,XF
TERMINATE


ATEST
TEST G P1,1
ASEND
ATRNT
TEST L R$ATRN,P5
ATRNE
ASEND
ADVANCE
1
TRANSFER FN
FTHFR
ATRNE
ENTER
ATRN,PHS
DEPART
QATRN,3
LINK
ATRNC,1PH
ATRNL
LEAVE
ATRN,PHS
TRANSFER
TMTST
BTEST
TEST G P1,1
BSEND
BTRNT
TEST L R$BTRN,P5
BTRNE
BSEND
ADVANCE
1
TRANSFER FN
FN$FTHSV
BTRNE
ENTER
BTRN,PHS
DEPART
QBTRN,3
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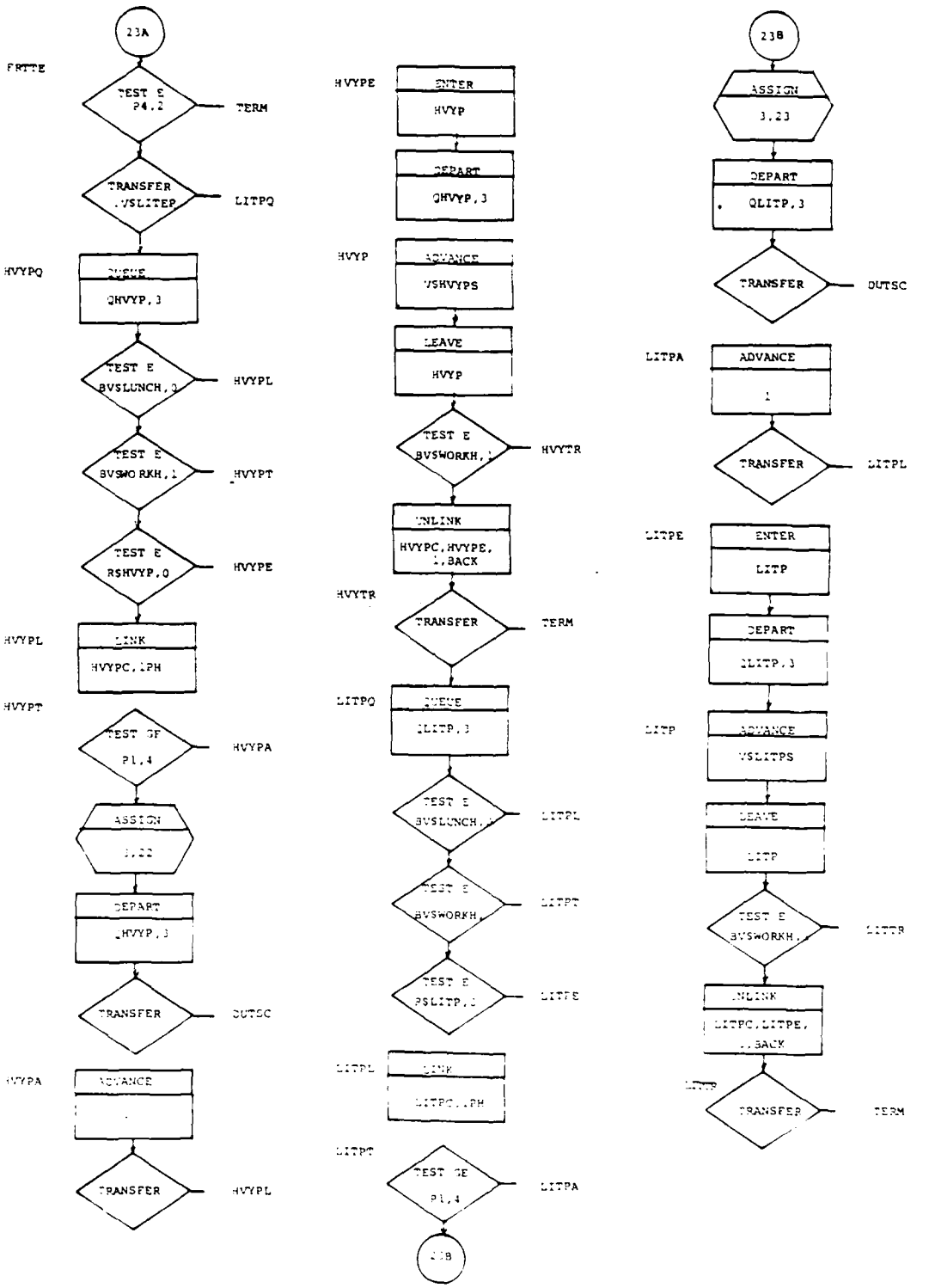
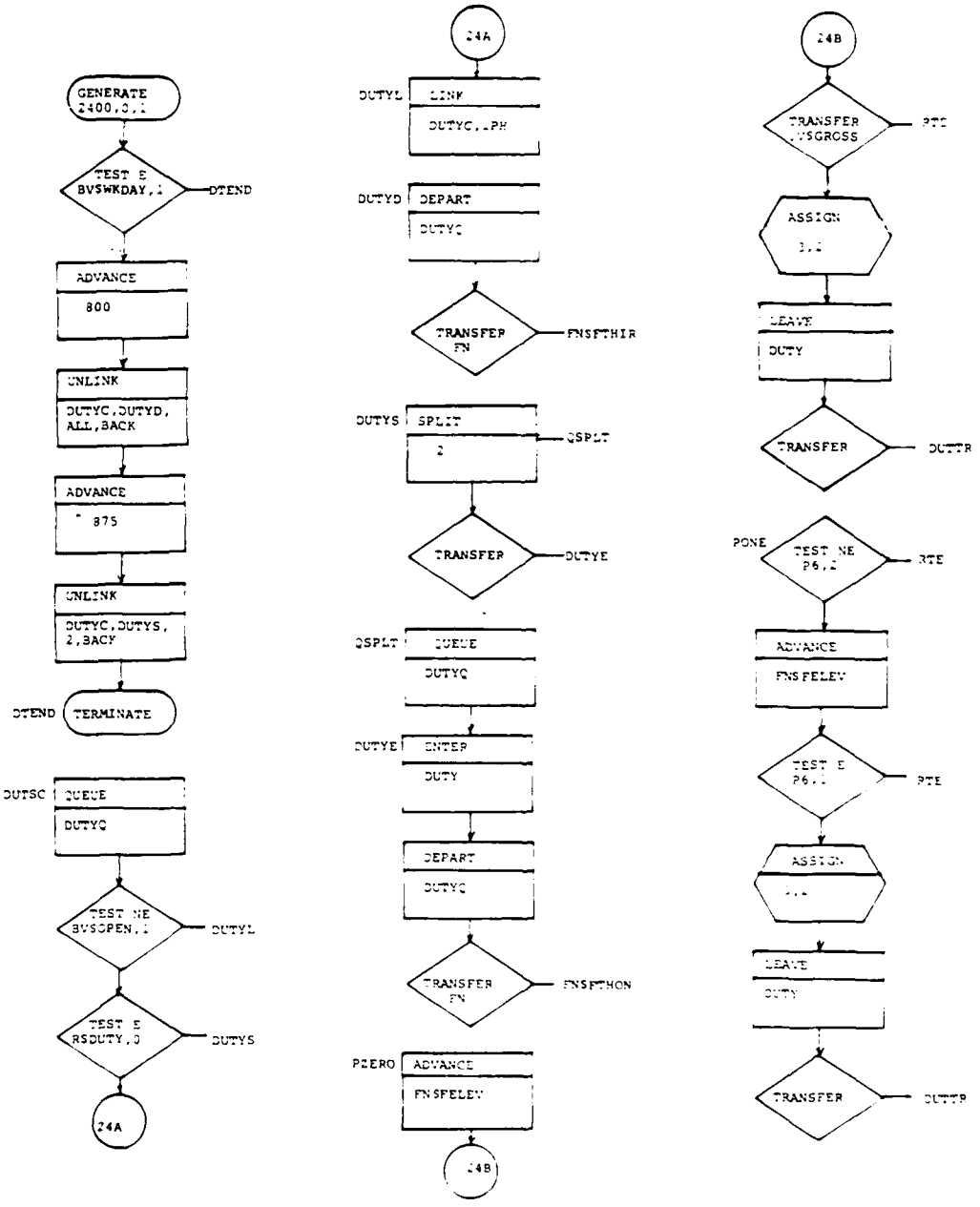
BTRNC,1PH
BTRNL
LEAVE
BTRN,PHS
TMTST
TEST NE P4,1
TERM
ADVANCE
1?
33A


23A
ENTTE
TEST E P4,2
TERM
TRANSFER .VSLITEP
LITPQ
HVYPQ
QUEUE QHVYP,3
TEST E BVSLUNCH,3
HVYPL
TEST E BVSWORKH,1
HVYPT
TEST E RSHVYP,0
HVYPE
HVYPL
LINK HVYPC,1PH
HVYPT
TEST GE P1,4
HVYPA
ASSIGN 3,23
DEPART .HVYP,3
TRANSFER
OUTSC
HVYPA
ADVANCE
TRANSFER
HVYPL
HVYPE
ENTER HVYP
DEPART QHVYP,3
HVYP
ADVANCE VSHVYPS
LEAVE HVYP
TEST E BVSWORKH,1
HVYTR
UNLINK HVYPC,HVYPE,1,BACK
HVYTR
TRANSFER
TERM
LITPQ
QUEUE QLITP,3
TEST E BVSLUNCH,3
LITPL
TEST E BVSWORKH,1
LITPT
TEST E PSLITP,3
LITPE
LITPL
LINK LITPC,1PH
LITPT
TEST GE P1,4
LITPA
23B
23B
ASSIGN 3,23
DEPART QLITP,3
TRANSFER
OUTSC
LITPA
ADVANCE 1
TRANSFER
LITPL
LITPE
ENTER LITP
DEPART QLITP,3
LITP
ADVANCE VSLITPS
LEAVE LITP
TEST E BVSWORKH,1
LITTR
UNLINK LITPC,LITPE,1,BACK
LITTR
TRANSFER
TERM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BVSWKDAY,1
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ADVANCE
800
UNLINK
DUTYC,DUTYD,
ALL,BACK
ADVANCE
875
UNLINK
DUTYC,DUTYS,
2,BACK
DTEND
TERMINATE
DUTSC
QUEUE
DUTYQ
TEST NE
BVSOPEN,1
DUTYL
TEST E
RSDUTY,0
DUTYS
24A
24A
DUTYL
LINK
DUTYC,,PH
DUTYD
DEPART
DUTYC
TRANSFER
FN
FNSFTHIR
DUTYS
SPLIT
2
QSPLT
TRANSFER
DUTYE
QSPLT
QUEUE
DUTYQ
DUTYE
ENTER
DUTY
DEPART
DUTYQ
TRANSFER
FN
FNSFTHON
PZERO
ADVANCE
FNSFELEV
24B
24B
TRANSFER
.VSGROSS
PTE
ASSIGN
LEAVE
DUTY
TRANSFER
DUTTR
PONE
TEST NE
P6,2
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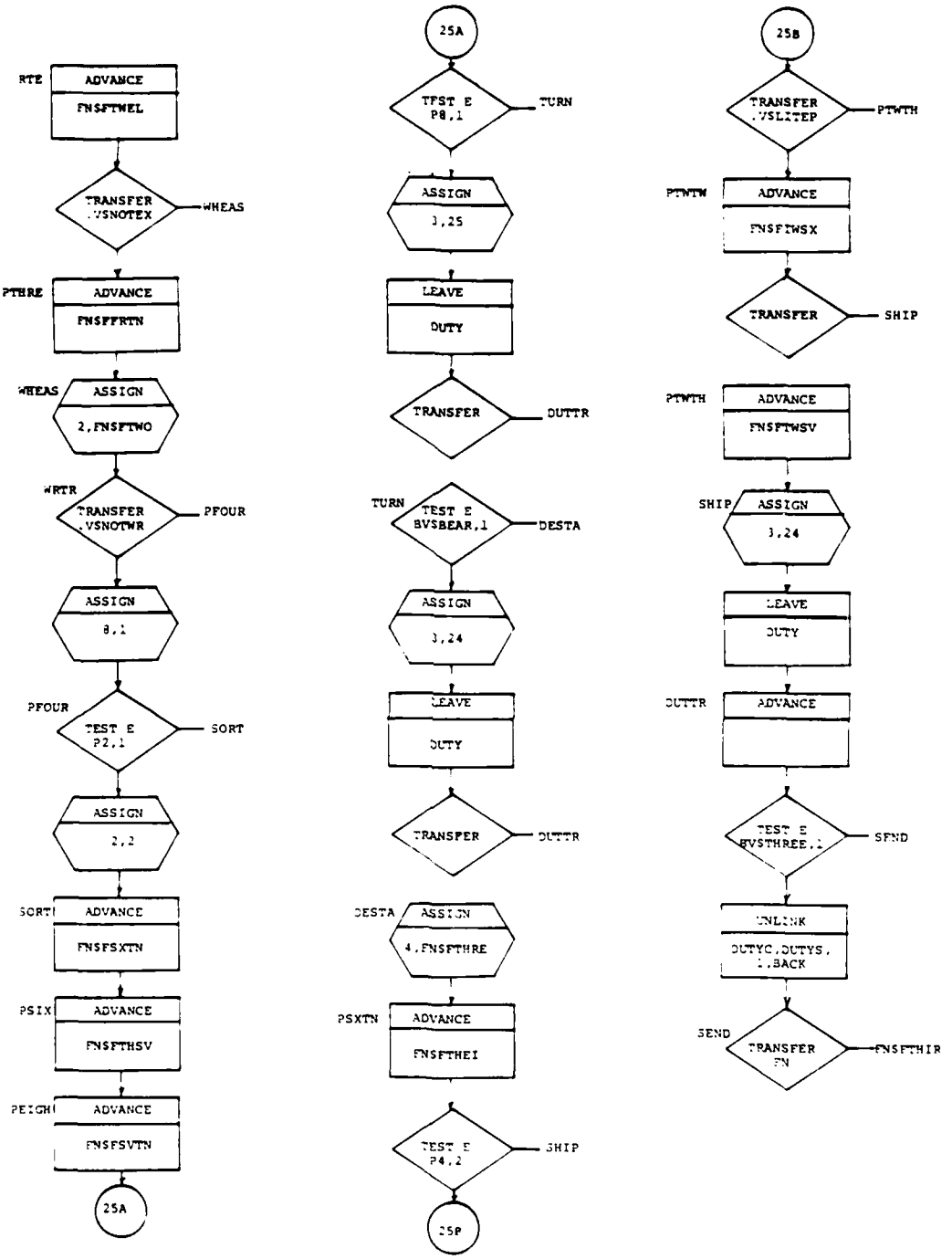
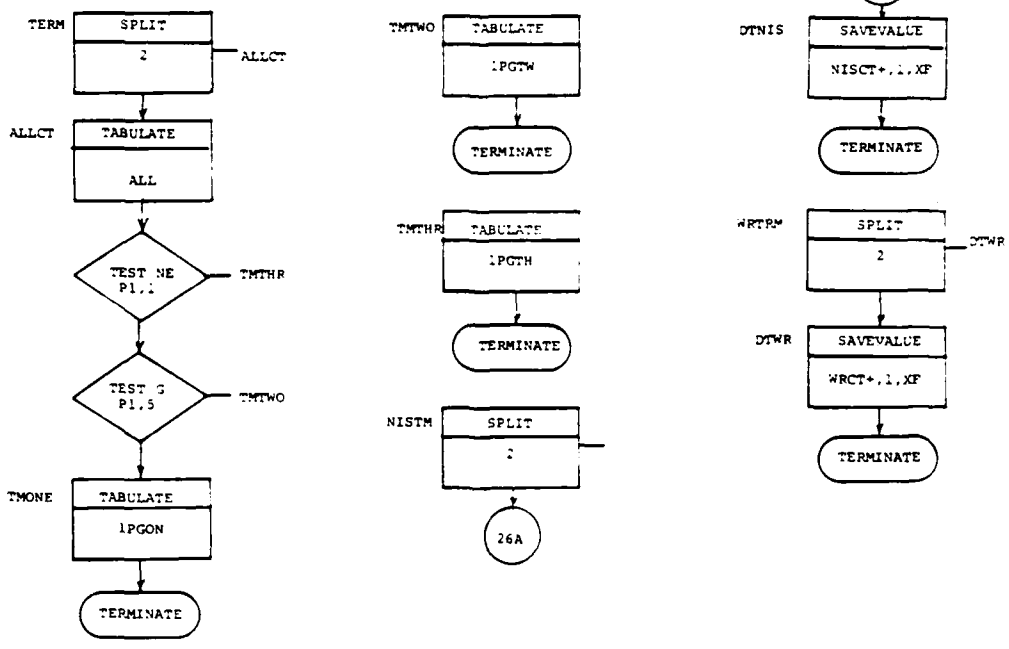
ADVANCE
FNSFELEV
TEST E
P6,1
PTE
ASSIGN
LEAVE
DUTY
TRANSFER
DUTTR


RTE
ADVANCE
FNSFTWEL
TRANSFER
.VSNOTEX
WHEAS
PTHRE
ADVANCE
FNSFFRTN
WHEAS
ASSIGN
2,FNSFTWO
WRTR
TRANSFER
.VSNOTWR
PFOUR
ASSIGN
0,1
PFOUR
TEST E
P2,1
SORT
ASSIGN
2,2
SORT
ADVANCE
FNSFSXTN
PSIX
ADVANCE
FNSFTHSV
PEIGH
ADVANCE
FNSFSVTN
25A
25A
TFST E
P0,1
TURN
ASSIGN
3,25
LEAVE
DUTY
TRANSFER
DUTTR
TURN
TEST E
BVSBEAR,1
DESTA
ASSIGN
3,24
LEAVE
DUTY
TRANSFER
DUTTR
DESTA
ASSIGN
4,FNSFTHRE
PSXTN
ADVANCE
FNSFTHEI
TEST E
P4,2
SHIP
25P
25B
TRANSFER
.VSLITEP
PTWTH
PTWTN
ADVANCE
FNSFTWSX
TRANSFER
SHIP
PTWTH
ADVANCE
FNSFTWSV
SHIP
ASSIGN
3,24
LEAVE
DUTY
DUTTR
ADVANCE
TEST E
BVSTHREE,1
SEND
UNLINK
DUTYC,DUTYS,
1,BACK
SEND
TRANSFER
FN
FNSFTHIR


TERM
SPLIT
2
ALLCT
ALLCT
TABULATE
ALL
TEST NE
P1,1
TMTHR
TEST G
P1,5
TMTWO
TMONE
TABULATE
1PGON
TERMINATE
TMTWO
TABULATE
1PGTW
TERMINATE
TMTHR
TABULATE
1PGTH
TERMINATE
NISTM
SPLIT
2
26A
26A
DTNIS
SAVEVALUE
NISCT+,1,XF
TERMINATE
WRTRM
SPLIT
2
DTWR
DTWR
SAVEVALUE
WRCT+,1,XF
TERMINATE

APPENDIX C

PROGRAM OUTPUT

TABLE OF CONTENTS

THIS IS SNAP 4 OF 4

RELATIVE CLOCK 67200 ABSOLUTE CLOCK 100800

BLOCK COUNTS

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
1	0	4	11	0	20	21	0	20	31	0	60	41	0	60
2	0	4	12	0	20	22	0	20	32	0	60	42	0	60
3	0	28	13	0	20	23	0	20	33	0	60	43	0	40
4	0	28	14	0	20	24	0	20	34	0	60	44	0	40
5	0	20	15	0	20	25	0	28	35	0	60	45	0	40
6	0	20	16	0	20	26	0	60	36	0	60	46	0	40
7	0	20	17	0	20	27	0	60	37	0	60	47	0	40
8	0	20	18	0	20	28	0	60	38	0	60	48	0	40
9	0	20	19	0	20	29	0	60	39	0	60	49	0	40
10	0	20	20	0	20	30	0	60	40	0	60	50	0	40
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
51	0	40	61	0	20	71	0	20	81	0	40	91	0	40
52	0	40	62	0	20	72	0	20	82	0	40	92	0	40
53	0	40	63	0	20	73	0	20	83	0	40	93	0	28
54	0	40	64	0	20	74	0	20	84	0	40	94	0	28
55	0	40	65	0	20	75	0	20	85	0	40	95	0	704
56	0	40	66	0	20	76	0	40	86	0	40	96	0	704
57	0	40	67	0	20	77	0	40	87	0	40	97	0	704
58	0	40	68	0	20	78	0	40	88	0	40	98	0	28
59	0	40	69	0	20	79	0	40	89	0	40	99	0	28
60	0	20	70	0	20	80	0	40	90	0	40	100	0	10904
BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
101	0	10904	111	0	1012	121	0	173	131	0	8800	141	0	672
102	0	10904	112	0	1012	122	0	173	132	0	13260	142	0	461
103	0	28	113	0	44	123	0	173	133	0	7322	143	0	10
104	0	28	114	0	13260	124	0	173	134	0	4815	144	0	10
105	0	640	115	0	13260	125	0	4287	135	0	1646	145	0	10
106	0	640	116	0	13260	126	0	4287	136	0	1646	146	0	451
107	0	640	117	0	13260	127	0	4287	137	0	2507	147	0	451
108	0	28	118	0	13260	128	0	4287	138	0	2507	148	0	2489
109	0	28	119	0	13260	129	0	8800	139	0	2315	149	0	2489
110	0	1012	120	0	4460	130	0	8800	140	0	1854	150	0	2489

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
151	0	2489	161	0	1746	171	0	1766	181	0	4655	191	0	9277
152	0	2489	162	0	98	172	0	1766	182	0	4655	192	0	2688
153	0	2470	163	0	31	173	0	1766	183	0	4655	193	0	2688
154	0	2489	164	0	24	174	0	1752	184	0	4655	194	0	2688
155	0	1627	165	0	24	175	0	1766	185	0	4655	195	0	2688
156	0	1627	166	0	24	176	0	41	186	0	4624	196	0	13440
157	0	4815	167	0	7	177	0	4652	187	0	4655	197	0	13440
158	0	1790	168	0	7	178	0	4652	188	0	1593	198	0	13440
159	0	1790	169	0	1766	179	0	3532	189	0	5938	199	0	6931
160	0	1777	170	0	1766	180	0	2053	190	0	9574	200	0	6931

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
201	0	4772	211	0	2642	221	0	523	231	0	906	241	0	8574
202	0	2159	212	0	2642	222	0	1	232	0	906	242	0	8571
203	0	6946	213	0	2642	223	0	1	233	0	906	243	0	5953
204	0	6946	214	0	9588	224	0	1	234	0	904	244	1	135
205	0	6946	215	0	8708	225	0	1	235	0	906	245	0	134
206	0	6946	216	0	905	226	0	522	236	0	23	246	0	5953
207	0	6946	217	0	905	227	0	522	237	0	8706	247	0	5953
208	0	2643	218	0	854	228	0	906	238	0	8706	248	0	5584
209	0	2643	219	0	331	229	0	906	239	0	25	249	0	2111
210	0	2642	220	0	615	230	0	906	240	0	8706	250	0	4886

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
251	0	3473	261	0	5940	271	0	4	281	0	2619	291	0	1
252	0	10	262	0	5924	272	0	4	282	0	1445	292	0	1431
253	0	10	263	0	5940	273	0	1546	283	0	28	293	0	1431
254	0	10	264	0	2618	274	0	1546	284	0	28	294	0	1426
255	0	3463	265	0	2618	275	0	2619	285	0	28	295	0	1426
256	0	3463	266	0	2461	276	0	2619	286	0	1445	296	0	1426
257	0	5940	267	0	913	277	0	2619	287	0	14	297	0	1426
258	0	5940	268	0	2337	278	0	2619	288	0	13	298	0	1426
259	0	5940	269	0	1550	279	0	2619	289	0	13	299	0	2688
260	0	5940	270	0	4	280	0	2611	290	0	1	300	0	2688

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
301	0	2688	311	0	2	321	0	1451	331	0	1453	341	0	232
302	0	7114	312	0	7092	322	0	1206	332	0	1453	342	0	2
303	0	7114	313	0	7100	323	0	9	333	0	1453	343	0	2
304	0	84	314	0	7100	324	0	9	334	0	1262	344	0	2
305	0	22	315	0	7100	325	0	9	335	0	1453	345	0	2
306	0	20	316	0	7100	326	0	9	336	0	1451	346	0	0
307	0	20	317	0	7120	327	0	0	337	0	508	347	0	0
308	0	20	318	0	1462	328	0	0	338	0	508	348	0	506
309	0	2	319	0	1462	329	0	1453	339	0	508	349	0	506
310	0	2	320	0	1460	330	0	1453	340	0	506	350	0	506

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
351	0	506	361	0	682	371	0	679	381	0	665	391	0	0
352	0	506	362	0	681	372	0	679	382	0	253	392	0	16
353	0	417	363	0	678	373	0	679	383	0	446	393	0	16
354	0	506	364	0	537	374	0	679	384	0	446	394	0	446
355	0	505	365	0	3	375	0	679	385	0	446	395	0	446
356	0	497	366	0	3	376	0	641	386	0	446	396	0	446
357	0	497	367	0	3	377	0	679	387	0	389	397	0	446
358	0	497	368	0	3	378	0	677	388	0	16	398	0	446
359	0	36	369	0	0	379	0	665	389	0	0	399	0	391
360	0	682	370	0	0	380	0	665	390	0	0	400	0	446

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
401	0	445	411	0	410	421	0	410	431	0	402	441	0	4123
402	0	437	412	0	410	422	0	410	432	0	78	442	0	83
403	0	437	413	0	410	423	0	410	433	0	5	443	0	6
404	0	437	414	0	267	424	0	410	434	0	5	444	0	6
405	0	129	415	0	0	425	0	410	435	0	397	445	0	6
406	0	2	416	0	0	426	0	384	436	0	1137	446	0	77
407	0	2	417	0	0	427	0	410	437	0	4314	447	0	77
408	0	435	418	0	0	428	0	408	438	0	4314	448	0	4308
409	0	7251	419	0	0	429	0	402	439	0	4313	449	0	4308
410	0	410	420	0	0	430	0	402	440	0	4307	450	0	4308

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
451	0	4308	461	0	26	471	0	0	481	0	401	491	0	470
452	0	4308	462	0	4202	472	0	0	482	0	399	492	0	470
453	0	4100	463	0	7105	473	0	0	483	0	392	493	0	469
454	0	4308	464	0	401	474	0	0	484	0	392	494	0	468
455	0	4296	465	0	401	475	0	401	485	0	392	495	0	234
456	0	4228	466	0	401	476	0	401	486	0	50	496	0	1
457	0	4228	467	0	401	477	0	401	487	0	2	497	0	1
458	0	4228	468	0	328	478	0	401	488	0	2	498	0	1
459	0	1355	469	0	0	479	0	401	489	0	390	499	0	1
460	0	26	470	0	0	480	0	389	490	0	2154	500	0	0

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
501	0	0	511	0	455	521	0	40	531	0	0	541	0	290
502	0	469	512	0	455	522	0	20	532	0	289	542	0	290
503	0	469	513	0	118	523	0	20	533	0	289	543	0	28
504	0	469	514	0	3	524	0	20	534	0	290	544	0	28
505	0	469	515	0	3	525	0	20	535	0	0	545	0	28
506	0	469	516	0	452	526	0	20	536	0	0	546	0	28
507	0	397	517	0	943	527	0	20	537	0	0	547	0	28
508	0	469	518	0	28	528	0	289	538	0	290	548	0	28
509	0	468	519	0	28	529	0	5	539	0	290	549	0	28
510	0	455	520	0	8	530	0	0	540	0	290	550	0	28

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
551	0	28	561	0	81	571	0	97	581	0	97	591	0	4573
552	0	28	562	0	81	572	0	97	582	0	97	592	0	4798
553	0	40	563	0	81	573	0	97	583	0	5128	593	0	4907
554	0	20	564	0	81	574	0	97	584	0	5504	594	0	8047
555	0	19	565	0	81	575	0	97	585	0	4667	595	0	8047
556	0	20	566	0	81	576	0	97	586	0	4667	596	0	1263
557	0	3	567	0	81	577	0	97	587	0	4573	597	0	1263
558	0	112	568	0	81	578	0	97	588	0	4573	598	0	1263
559	0	40	569	0	81	579	0	97	589	0	4573	599	0	1263
560	0	160	570	0	97	580	0	97	590	0	4573	600	0	5836

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
601	0	5478	611	0	0	621	0	337	631	0	565	641	0	28
602	0	5768	612	0	0	622	0	3672	632	0	565	642	0	20
603	0	4003	613	0	28	623	0	3672	633	0	3660	643	0	20
604	0	331	614	0	28	624	0	3672	634	0	3660	644	0	20
605	0	331	615	0	337	625	0	3672	635	0	3660	645	0	20
606	0	331	616	0	337	626	0	4093	636	0	3660	646	0	28
607	0	331	617	0	337	627	0	565	637	0	3660	647	0	111
608	0	221	618	0	337	628	0	0	638	0	3470	648	0	111
609	0	28	619	0	337	629	0	0	639	0	3660	649	0	75
610	0	0	620	0	263	630	0	0	640	0	28	650	0	43

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
651	0	0	661	0	10	671	0	56	681	0	173	691	0	186
652	0	0	662	0	10	672	0	6	682	0	0	692	0	112
653	0	333	663	0	10	673	0	59	683	0	0	693	0	6
654	0	111	664	0	72	674	0	59	684	0	0	694	0	6
655	0	222	665	0	72	675	0	0	685	0	173	695	0	106
656	0	333	666	0	72	676	0	101	686	0	101	696	0	186
657	0	333	667	0	36	677	0	30	687	0	101	697	0	186
658	0	333	668	0	36	678	0	101	688	0	101	698	0	333
659	0	30	669	0	36	679	0	110	689	0	72	699	0	333
660	0	30	670	0	56	680	0	173	690	0	186	700	0	111

BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL	BLOCK	CURRENT	TOTAL
701	0	333	711	0	17157									
702	0	25698	712	0	13590									
703	0	25985	713	0	13636									
704	0	25985	714	0	13636									
705	0	8828	715	0	69									
706	0	353	716	0	69									
707	0	353	717	0	69									
708	0	8475												
709	0	8475												
710	0	17157												

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* USER CHAINS *
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USER CHAIN	TOTAL ENTRIES	AVERAGE TIME/TRANS	CURRENT CONTENTS	AVERAGE CONTENTS	MAXIMUM CONTENTS
MAINC	4123	206.674		12.680	153
FCH	2162	267.294	3	8.599	31
ACH	7279	350.811	46	37.999	65
BCH	1138	200.007	3	3.387	15
JCH	945	267.903	3	3.767	16
PTRNC	290	442.155		1.908	20
SKCKC	724	1507.440	60	16.240	71
CRTEC	98	287.285		.418	5
DEEXC	618	75.906	1	.698	41
SCNTC	4899	111.655	16	8.139	231
STOFC	2346	149.248	4	5.210	105
YMCSC	1206	126.582		2.271	63
YKCSC	232	87.969		.303	14
DRYHC	537	84.059		.671	24
AHHEC	389	234.964		1.360	18
BHHEC	267	66.715		.265	12
FHHEC	328	80.234		.391	15
JHHEC	234	80.670		.280	11
HVYPC	228	430.140	1	1.459	10
LITPC	4093	409.713	12	24.954	106
DRTEC	2148	884.417	92	28.269	119
THREE	5039	2850.916	261	213.776	302
TWO	2199	735.309	31	24.061	52
ONE	2643	2.065	1	.081	9
DLVRC	1496	2609.096	70	58.083	91
BIKEC	7109	176.599	9	18.682	200
HCH	7178	562.773	97	60.112	102
ATRNC	4573	37.174		2.529	81
BTRNC	1263	28.735		.540	17
DUTYC	43	121.534		.077	6

STORAGES

STORAGE	CAPACITY	AVERAGE CONTENTS	ENTRIES	AVERAGE TIME/UNIT	-AVERAGE TOTAL TIME	UTILIZATION AVAIL. TIME	DURING- UNAVAIL. TIME	CURRENT STATUS	PERCENT AVAILABILITY	CURRENT CONTENTS	MAXIMUM CONTENTS
SKCK	6	.111	2489	2.994	.018	.077	.000	NA	23.8		6
CRTE	5	.081	1766	3.087	.016	.068	.000	NA	23.8		5
DRTE	2	.208	4655	3.001	.103	.434	.000	NA	23.8		2
DEEX	2	.044	906	3.262	.021	.092	.000	NA	23.8		2
SCPR	100000	.000	6946	.000	.000				100.0		1
CSPR	100000	.000	2642	.000	.000				100.0		1
SCNT	4	.269	5940	3.044	.067	.282	.000	NA	23.8		4
STOF	1	.117	2619	2.998	.116	.490	.000	NA	23.8		1
DLVR	100000	3.175	1426	149.621	.000				100.0		91
YMCS	11	1.118	1453	51.714	.101	.388	.011	NA	23.8		11
YKCS	4	.391	506	51.974	.097	.366	.013	NA	23.8		4
DRYW	2	.214	679	21.227	.107	.434	.004	NA	23.8		2
AWWE	2	.355	446	53.504	.177	.696	.015	NA	23.8		2
BWWE	2	.174	410	28.451	.086	.355	.002	NA	23.8		2
MAIN	8	1.535	4308	23.952	.191	.781	.007	NA	23.8		8
FWWE	1	.096	401	16.035	.095	.396	.001	NA	23.8		1
JWWE	4	.390	469	55.951	.097	.367	.013	NA	23.8		4
ATRN	32000	1373.081	2493603	37.003	.042				100.0		31998
BTRN	32000	1324.309	3019653	29.471	.041				100.0		31986
PTRN	32000	37.344	313686	8.000	.001				100.0		22221
LITP	5	1.138	3660	20.899	.227	.925	.009	NA	23.8		5
HVYP	3	.583	337	116.279	.194	.704	.035	NA	23.8		3
DUTY	2	.082	333	16.462	.040				100.0		2
BIKE	100000	2.209	7100	20.912	.000				100.0		200

QUEUES

QUEUE	MAXIMUM CONTENTS	AVERAGE CONTENTS	TOTAL ENTRIES	ZERO ENTRIES	PERCENT ZEROS	AVERAGE TIME/TRANS	$AVERAGE TIME/TRANS	TABLE NUMBER	CURRENT CONTENTS
QSKCK	213	48.743	7677	5502	71.6	426.674	1506.013		180
QCRTE	18	1.259	5370	5136	95.6	15.755	361.563		
QDRTE	357	84.814	14241	7791	54.7	400.220	883.650		276
QSCPR	1035	713.513	21714	12	.0	2208.166	2209.387		876
QCSPR	27	.243	7929	1479	18.6	2.065	2.539		3
QDEEX	123	2.117	2724	870	31.9	52.237	76.750		3
QSCNT	693	24.574	17898	3201	17.8	92.266	112.362		48
QSTOF	315	15.700	7881	849	10.7	133.872	150.034		12
QDLVR	273	174.250	4488	15	.3	2609.096	2617.845		210
QBIKE	600	56.046	21393	174	.8	176.054	177.498		27
QYMCS	189	6.917	4386	975	22.2	105.980	136.274		
QYKCS	42	.920	1524	828	54.3	40.606	88.913		
QDRYW	72	2.015	2046	435	21.2	66.187	84.059		
QAHHE	54	4.171	1338	219	16.3	209.488	250.487		
QBTRN	258	135.820	3945	42	1.0	2313.599	2338.495		156
QBHHE	36	.795	1230	429	34.8	43.446	66.715		
QMAIN	459	38.052	12942	1068	8.2	197.582	215.354		
QATRN	357	206.345	14019		.0	989.117	989.117		300
QFHHE	45	1.174	1203	219	18.2	65.628	80.234		
QJHHE	33	.851	1410	711	50.4	40.597	81.892		
QPTRN	60	5.724	870		.0	442.155	442.155		
QHVYP	30	4.383	1014	414	40.8	290.473	490.899		3
QLITP	318	74.889	11016	471	4.2	456.842	477.247		36
DUTYQ	8	.119	333	143	42.9	24.096	42.231		

$AVERAGE TIME/TRANS = AVERAGE TIME/TRANS EXCLUDING ZERO ENTRIES

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* TABLES *
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TABLE ALL

ENTRIES IN TABLE	MEAN ARGUMENT	STANDARD DEVIATION	SUM OF ARGUMENTS	
25985	4601.589	3488.000	119572384.000	NON-WEIGHTED

UPPER LIMIT	OBSERVED FREQUENCY	PER CENT OF TOTAL	CUMULATIVE PERCENTAGE	CUMULATIVE REMAINDER	MULTIPLE OF MEAN	DEVIATION FROM MEAN
0	0	.00	.0	100.0	-.000	-1.319
1200	4201	16.16	16.1	83.8	.260	-.975
2400	889	3.42	19.5	80.4	.521	-.631
3600	10155	39.08	58.6	41.3	.782	-.287
4800	525	2.02	60.6	39.3	1.043	.056
6000	2538	9.76	70.4	29.5	1.303	.400
7200	624	2.40	72.8	27.1	1.564	.744
8400	2958	11.38	84.2	15.7	1.825	1.088
9600	603	2.32	86.5	13.4	2.086	1.433
10800	2274	8.75	95.3	4.6	2.347	1.777
12000	189	.72	96.0	3.9	2.607	2.121
13200	669	2.57	98.6	1.3	2.868	2.465
14400	39	.15	98.7	1.2	3.129	2.809
15600	159	.61	99.3	.6	3.390	3.153
16800	15	.05	99.4	.5	3.650	3.497
18000	96	.36	99.8	.1	3.911	3.841
19200	3	.01	99.8	.1	4.172	4.185
20400	9	.03	99.8	.1	4.433	4.529
21600	3	.01	99.8	.1	4.694	4.873
22800	18	.06	99.9	.0	4.954	5.217
24000	0	.00	99.9	.0	5.215	5.561
OVERFLOW	18	.06	100.0	.0		

AVERAGE VALUE OF OVERFLOW 25119.00

TABLE IPGON

ENTRIES IN TABLE	MEAN ARGUMENT	STANDARD DEVIATION	SUM OF ARGUMENTS	
353	760.742	342.000	268542.000	NON-WEIGHTED

UPPER LIMIT	OBSERVED FREQUENCY	PER CENT OF TOTAL	CUMULATIVE PERCENTAGE	CUMULATIVE REMAINDER	MULTIPLE OF MEAN	DEVIATION FROM MEAN
0	0	.00	.0	100.0	-.000	-2.224
1200	332	94.05	94.0	5.9	1.577	1.284
2400	21	5.94	100.0	.0	3.154	4.793

REMAINING FREQUENCIES ARE ALL ZERO

TABLE IPGTW

ENTRIES IN TABLE	MEAN ARGUMENT	STANDARD DEVIATION	SUM OF ARGUMENTS	
8475	2720.000	2266.000	23052000.000	NON-WEIGHTED

UPPER LIMIT	OBSERVED FREQUENCY	PER CENT OF TOTAL	CUMULATIVE PERCENTAGE	CUMULATIVE REMAINDER	MULTIPLE OF MEAN	DEVIATION FROM MEAN
0	0	.00	.0	100.0	-.000	-1.200
1200	2918	34.43	34.4	65.5	.441	-.670
2400	508	5.99	40.4	59.5	.882	-.141
3600	3438	40.56	80.9	19.0	1.323	.388
4800	102	1.20	82.1	17.8	1.764	.917
6000	225	2.65	84.8	15.1	2.205	1.447
7200	216	2.54	87.3	12.6	2.647	1.977
8400	1041	12.28	99.6	.3	3.088	2.506
9600	15	.17	99.8	.1	3.529	3.036
10800	12	.14	100.0	.0	3.970	3.565

REMAINING FREQUENCIES ARE ALL ZERO

TABLE IPGTH

ENTRIES IN TABLE	MEAN ARGUMENT	STANDARD DEVIATION	SUM OF ARGUMENTS	
17157	5610.058	3580.000	96251840.000	NON-WEIGHTED

UPPER LIMIT	OBSERVED FREQUENCY	PER CENT OF TOTAL	CUMULATIVE PERCENTAGE	CUMULATIVE REMAINDER	MULTIPLE OF MEAN	DEVIATION FROM MEAN
0	0	.00	.0	100.0	-.000	-1.567
1200	951	5.54	5.5	94.4	.213	-1.231
2400	360	2.09	7.6	92.3	.427	-.896
3600	6717	39.15	46.7	53.2	.641	-.561
4800	423	2.46	49.2	50.7	.855	-.226
6000	2313	13.48	62.7	37.2	1.069	.108
7200	408	2.37	65.1	34.8	1.283	.444
8400	1917	11.17	76.2	23.7	1.497	.779
9600	588	3.42	79.7	20.2	1.711	1.114
10800	2262	13.18	92.9	7.0	1.925	1.449
12000	189	1.10	94.0	5.9	2.139	1.784
13200	669	3.89	97.9	2.0	2.352	2.120
14400	39	.22	98.1	1.8	2.566	2.455
15600	159	.92	99.0	.9	2.780	2.790
16800	15	.08	99.1	.8	2.994	3.125
18000	96	.55	99.7	.2	3.208	3.460
19200	3	.01	99.7	.2	3.422	3.796
20400	9	.05	99.7	.2	3.636	4.131
21600	3	.01	99.7	.2	3.850	4.466
22800	18	.10	99.8	.1	4.064	4.801
24000	0	.00	99.8	.1	4.278	5.136
OVERFLOW	18	.10	100.0	.0		
AVERAGE VALUE OF OVERFLOW		25119.00				

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*****************************************
*                                       *
*          FULLWORD SAVEVALUES          *
*                                       *
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NUMBER - CONTENTS		NUMBER - CONTENTS		NUMBER - CONTENTS		NUMBER - CONTENTS		NUMBER - CONTENTS		NUMBER - CONTENTS	
REQCT	39780	PRION	519	PRITN	12861	PRITH	26400	PNUM	20	ANUM	81
BNUM	97	NISCT	13636	WRCT	69						

END

***** TOTAL RUN TIME (INCLUDING ASSEMBLY) = 4.74 MINUTES *****

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END

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